# **Regulations Compliance Report**

Printed on 28 October 2020	013 Edition, England assessed by a at 14:54:45	Stroma FSAP 2012 program, Ver	rsion: 1.0.5.9
Project Information:			
Assessed By: Zahid A	shraf (STRO001082)	Building Type:	Flat
Dwelling Details:			
NEW DWELLING DESIGN	STAGE	Total Floor Area: 8	6.6m <sup>2</sup>
	ge Lane	Plot Reference:	Plot 19
Address :	5		
Client Details:			
Name:			
Address :			
This report covers items in	ncluded within the SAP calculation	ons.	
-	of regulations compliance.		
1a TER and DER			
Fuel for main heating system	ו: Mains gas (c)		
Fuel factor: 1.00 (mains gas	(c))		
Target Carbon Dioxide Emis		16.42 kg/m²	
Dwelling Carbon Dioxide Err	ission Rate (DER)	10.12 kg/m²	ОК
1b TFEE and DFEE			
Target Fabric Energy Efficien	• • •	46.2 kWh/m <sup>2</sup>	
Dwelling Fabric Energy Effic	iency (DFEE)	37.6 kWh/m²	
			OK
2 Fabric U-values	•		
Element	Average	Highest	01/
External wall	0.15 (max. 0.30)	0.15 (max. 0.70)	OK
Floor	0.12 (max. 0.25)	0.12 (max. 0.70)	OK
Roof	(no roof)	4.40 (march 0.00)	01/
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	OK
2a Thermal bridging			
	alculated from linear thermal transr	mittances for each junction	
3 Air permeability			
Air permeability at 50 Maximum	pascals	3.00 (design valu 10.0	ue) OK
		10.0	UK
4 Heating efficiency			
Main Heating system:	Community heating so	chemes - mains gas	
	N		
Secondary heating sy	stem: None		
5 Cylinder insulation			
Hot water Storage:	No cylinder		
6 Controls			
Space beating centre	Charging system links	d to use of community bacting	
Space heating control		ed to use of community heating, ast two room thermostats	ОК
Hot water controls:	No cylinder thermosta		ÖN
	No cylinder		

# **Regulations Compliance Report**

7 Low energy lights		
Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	ОК
8 Mechanical ventilation		
Continuous supply and extract system		
Specific fan power:	1.02	
Maximum	1.5	ОК
MVHR efficiency:	93%	
Minimum	70%	ОК
9 Summertime temperature		
Overheating risk (Thames valley):	Slight	OK
Based on:		
Overshading:	Average or unknown	
Windows facing: South East	6.1m <sup>2</sup>	
Windows facing: South West	6.07m <sup>2</sup>	
Windows facing: North West	4.58m <sup>2</sup>	
Ventilation rate:	6.00	
10 Key features		
Air permeablility	3.0 m³/m²h	
External Walls U-value	0.13 W/m²K	
Floors U-value	0.12 W/m²K	
Community heating, heat from boilers – mains gas		
Photovoltaic array		

			User D	etails:						
Assessor Name: Software Name:	Zahid Ashraf Stroma FSAP 20	12		Stroma Softwa					001082 on: 1.0.5.9	
		Pro	operty A	Address:	Plot 19					
Address :										
1. Overall dwelling dime	nsions:									
Ground floor			Area 8	. ,	(1a) x	<b></b>	<b>ight(m)</b> 2.5	(2a) =	<b>Volume(m<sup>3</sup></b> 216.5	<b>)</b> (3a)
Total floor area TFA = (1a	a)+(1b)+(1c)+(1d)+(1	e)+(1n)	) 8	6.6	(4)					
Dwelling volume			L		(3a)+(3b)	+(3c)+(3d	l)+(3e)+	.(3n) =	216.5	(5)
2. Ventilation rate:										
		secondary heating	/	other		total			m <sup>3</sup> per hou	r
Number of chimneys	0 +	0	] + [	0	] = [	0	X 4	40 =	0	(6a)
Number of open flues	0 +	0	i + 🗖	0	1 = F	0	x	20 =	0	(6b)
Number of intermittent far	ובבבים ביום ביום ווים ווים ביום ביום ביו				」 「	0	x /	10 =	0	(7a)
Number of passive vents						0	x ^	10 =	0	(7b)
Number of flueless gas fir	res					0	x 4	40 =	0	(7c)
C C						-		A * I		
								Air ch	anges per ho	ur
Infiltration due to chimney If a pressurisation test has be					ontinuo fr	0		÷ (5) =	0	(8)
Number of storeys in th		ieu, proceeu	10 (17), 0		onunue no	011 ( <i>3)</i> 10 (	10)		0	(9)
Additional infiltration	g ()						[(9)	-1]x0.1 =	0	(10)
Structural infiltration: 0.	25 for steel or timber	frame or (	0.35 for	masonr	y constr	uction			0	(11)
if both types of wall are pro deducting areas of openin		sponding to t	the greate	er wall area	a (after					_
If suspended wooden fl	- · · ·	aled) or 0.1	l (seale	d), else	enter 0				0	(12)
If no draught lobby, ent		,	,	,.					0	(13)
Percentage of windows	and doors draught	stripped							0	(14)
Window infiltration				0.25 - [0.2	x (14) ÷ 1	= [00			0	(15)
Infiltration rate				(8) + (10) ·	+ (11) + (1	2) + (13) -	+ (15) =		0	(16)
Air permeability value,	q50, expressed in cu	bic metres	s per ho	ur per so	quare m	etre of e	nvelope	area	3	(17)
If based on air permeabili	•								0.15	(18)
Air permeability value applies		as been done	e or a deg	ree air pei	meability i	is being u	sed			
Number of sides sheltered Shelter factor	u			(20) = 1 - [	0.075 x (1	9)] =			0.92	(19) (20)
Infiltration rate incorporati	ng shelter factor			(21) = (18)		/-			0.32	(21)
Infiltration rate modified for	-	d		. , . ,					0.14	
	Mar Apr May	<u> </u>	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind spe	eed from Table 7									
<u> </u>	4.9 4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7		
		. I								
Wind Factor $(22a)m = (22)$ (22a)m = 1.27 1.25 1	2)m ÷ 4 1.23 1.1 1.08	0.95	0.95	0.92	1	1.08	1.12	1.18		
		0.00	0.00	0.02	•				l	

Adjuste	ed infiltr	ation rat	e (allowi	ng for sh	elter an	d wind s	peed) =	(21a) x	(22a)m			_		
	0.18	0.17	0.17	0.15	0.15	0.13	0.13	0.13	0.14	0.15	0.16	0.16		
		<i>ctive air</i> al ventila	•	rate for t	he appli	cable ca	se						0.5	(23a)
				endix N, (2	3b) = (23a	ı) × Fmv (e	equation (N	√5)) , other	wise (23b	) = (23a)			0.5	(23a)
								n Table 4h)		, , ,			79.05	(23c)
			-	-	-					2b)m + (	23b) x [	1 – (23c)		(200)
(24a)m=		0.28	0.27	0.26	0.25	0.24	0.24	0.23	0.24	0.25	0.26	0.27		(24a)
		ed mecha	ı anical ve	entilation	without	heat rec	coverv (N	I ∕IV) (24b	)m = (22	1 2b)m + ()	1 23b)			
(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24b)
c) If	whole h	iouse ex	tract ver	tilation o	or positiv	ve input v	ventilatic	n from c	utside	Į	1	Į		
í	if (22b)n	n < 0.5 ×	(23b), t	hen (240	c) = (23b	); otherv	vise (24	c) = (22b	o) m + 0.	.5 × (23b	)			
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24c)
,						•		on from l 0.5 + [(2		0.5]				
(24d)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24d)
Effe	ctive air	change	rate - er	nter (24a	) or (24b	o) or (240	c) or (24	d) in box	x (25)		-	-		
(25)m=	0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.23	0.24	0.25	0.26	0.27		(25)
3. He	at losse	s and he	eat loss r	paramete	er:									
ELEN		Gros area	SS	Openin m	gs	Net Ar A ,r		U-valı W/m2		A X U (W/I	K)	k-value kJ/m²·ł		A X k J/K
Doors			( )			2	x	1.4		2.8				(26)
Window	ws Type	e 1				6.097	· x1/	/[1/( 1.4 )+	0.04] =	8.08	=			(27)
Window	ws Type	e 2				6.075	; x1/	/[1/( 1.4 )+	0.04] =	8.05	=			(27)
Window	ws Type	e 3				4.579	) x1/	/[1/( 1.4 )+	0.04] =	6.07	=			(27)
Floor						9.39	×	0.12		1.1268				(28)
Walls 1	Type1	78.7	<b>7</b> 5	16.7	5	62	×	0.15		9.3			$\dashv$	(29)
Walls 1	Гуре2	14.3	37	2		12.37	, x	0.14		1.75			$\dashv$	(29)
Walls 1	ГуреЗ	12.5	56	0		12.56	; x	0.13		1.66	= i		$\dashv$	(29)
Total a	rea of e	elements	, m²			115.0	8		I		I			(31)
		l roof wind as on both				alue calcula		formula 1,	/[(1/U-valı	ıe)+0.04] a	as given in	paragraph	3.2	
Fabric	heat los	ss, W/K :	= S (A x	U)				(26)(30)	+ (32) =				38.85	(33)
Heat c	apacity	Cm = S(	(Axk)						((28).	(30) + (32	2) + (32a)	(32e) =	1921.35	(34)
Therma	al mass	parame	ter (TMF	P = Cm ÷	- TFA) in	n kJ/m²K			Indica	itive Value	: Low		100	(35)
	•	sments wh ad of a de			constructi	ion are not	t known pr	ecisely the	indicative	e values of	TMP in T	able 1f		
Therma	al bridg	es : S (L	x Y) cal	culated u	using Ap	pendix k	<						12.71	(36)
		al bridging	are not kn	own (36) =	= 0.05 x (3	1)								
	abric he									· (36) =			51.56	(37)
Ventila		at loss ca								= 0.33 × (	r			
(28)~	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep		Nov	Dec		(38)
(38)m=	20.12	19.88	19.63	18.39	18.14	16.9	16.9	16.65	17.4	18.14	18.64	19.13		(30)
1				60.05	60 7	60.40	60.40	60.04		= (37) + (37) + (37)	-	70.00	l	
(39)m=	71.68	71.43	71.18	69.95	69.7	68.46	68.46	68.21	68.95	69.7 Average =	70.19	70.69	60 8 <del>8</del>	e 2 ( <del>3</del> 9)
Stroma I	- SAP 201	2 Version:	. 1.0.5.9 (S	AP 9.92) -	nttp://ww	w.stroma.c	:om			, worage =	Jun(00)1		<u> </u>	<u>e∠</u> opr <del>⁄/</del> ∕/

Heat lo	oss para	meter (H	HLP), W	/m²K					(40)m	= (39)m ÷	- (4)			
(40)m=	0.83	0.82	0.82	0.81	0.8	0.79	0.79	0.79	0.8	0.8	0.81	0.82		
Numbe	ar of day	rs in mo	nth (Tab	le 12)		1	1			Average =	Sum(40)1.	12 /12=	0.81	(40)
Numbe	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Wa	ater heat	ting ene	rgy requ	irement:								kWh/ye	ear:	
if TF				(1 - exp	(-0.0003	849 x (TF	<del>-</del> A -13.9	)2)] + 0.(	0013 x ( <sup>-</sup>	TFA -13		58		(42)
Reduce	the annua	al average	hot water		5% if the c	lwelling is	designed	(25 x N) to achieve		se target o		).41		(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate	er usage i	n litres per	r day for ea	ach month	Vd,m = fa	ctor from	Table 1c x	(43)			-			
(44)m=	110.45	106.43	102.41	98.4	94.38	90.37	90.37	94.38	98.4	102.41	106.43	110.45		
<b>F a a a a a a a a a a</b>					andeles d	400 ··· \/					m(44) <sub>112</sub> =		1204.88	(44)
			. <u> </u>	. <u> </u>		i		OTm / 3600		I				
(45)m=	163.79	143.25	147.82	128.88	123.66	106.71	98.88	113.47	114.82	133.81	146.07	158.62	4570 70	(45)
lf instan	taneous w	/ater heati	ng at point	t of use (no	o hot wate	r storage),	enter 0 in	boxes (46		i otal = Su	m(45) <sub>112</sub> =	-	1579.79	(45)
(46)m=	24.57	21.49	22.17	19.33	18.55	16.01	14.83	17.02	17.22	20.07	21.91	23.79		(46)
	storage			•					•		·			
-		. ,					-	within sa	ame ves	sel		0		(47)
	•	-		ank in dw er (this ir	-			n (47) ombi boil	ers) ente	er 'O' in <i>(</i>	(47)			
	storage		not mat			notantai					,			
a) If m	anufact	urer's de	eclared I	oss facto	or is kno	wn (kWł	n/day):					0		(48)
Tempe	erature f	actor fro	m Table	2b								0		(49)
			-	e, kWh/ye			_	(48) x (49)	) =		1	10		(50)
				cylinder l rom Tabl								02		(51)
		-	ee secti			1/1110/00	<b>xy</b> )				0.	02		(31)
	-	from Ta									1.	03		(52)
Tempe	erature f	actor fro	m Table	2b							0	.6		(53)
•••			-	e, kWh/ye	ear			(47) x (51)	) x (52) x (	53) =	1.	03		(54)
	. ,	(54) in (5			_						1.	03		(55)
Water	storage	loss cal	culated	for each	month	i	i	((56)m = (	55) × (41)	m	-			
(56)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(56)
If cylinde	er contain:	s dedicate	d solar sto	orage, (57)	m = (56)m	x [(50) – (	H11)] ÷ (5	50), else (5		m where (	H11) is fro	m Append	IX H	
(57)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)
	-	•	,	om Table								0		(58)
	-						. ,	65 × (41)		r tharma	vetat)			
(mod (59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	ng and a 23.26	22.51	23.26	22.51	23.26		(59)
(00)11=	20.20	21.01	20.20	22.01	20.20	22.01	20.20	20.20	22.01	20.20	22.01	20.20		

Combi	loss ca	alculated	for eac	ch	month (	(61)m =	(60	D) ÷ 36	65 × (41)	)m									
(61)m=	0	0	0		0	0		0	0	0		0	0		0	0	)		(61)
Total h	eat rec	quired for	water	he	ating ca	alculated	d fo	or eacl	h month	(62)	m =	0.85 × (	(45)m	+ (	(46)m +	(57)ı	m +	(59)m + (61)m	
(62)m=	219.07	193.18	203.1		182.37	178.94	1	160.2	154.16	168	.74	168.32	189.0	9	199.56	213	3.9		(62)
Solar DI	-IW input	calculated	using A	ppe	endix G or	Appendi	сH	(negati	ve quantity	/) (ent	er '0'	' if no sola	r contril	outi	on to wate	er hea	ting)		
(add a	dditiona	al lines if	FGHR	Sa	and/or \	WWHRS	S ap	oplies	, see Ap	penc	lix G	G)							
(63)m=	0	0	0		0	0		0	0	0		0	0		0	0	)		(63)
Output	from w	vater hea	ter																
(64)m=	219.07	193.18	203.1		182.37	178.94	1	160.2	154.16	168	.74	168.32	189.0	9	199.56	213	3.9		
											Outp	out from wa	ater hea	ater	(annual)₁	12		2230.63	(64)
Heat g	ains fro	om water	heatin	g,	kWh/m	onth 0.2	5 ´	[0.85	× (45)m	+ (6	1)m	n] + 0.8 x	< [(46)	m ·	+ (57)m	+ (5	9)m	]	
(65)m=	98.68	87.57	93.37	,	85.65	85.34	7	78.28	77.1	81.	95	80.97	88.7	1	91.36	96.	96		(65)
inclu	ide (57)	)m in calo	ulatio	n o	f (65)m	only if c	vlir	nder i	s in the c	dwell	ing	or hot w	ater is	s fr	om com	muni	ity ł	eating	
		jains (see			. ,	-					J							U U	
	Ŭ	ns (Table																	
Metab	Jan	Feb	Ma		Apr	May	Γ	Jun	Jul	A	ug	Sep	Oc	t	Nov	D	ec		
(66)m=	128.81		128.8	+	128.81	128.81	-	28.81	128.81	128	Ŭ	128.81	128.8		128.81	128			(66)
	n dains	s (calcula								l Iso s	<u>ee</u> -		I					1	
(67)m=	20.97	18.63	15.15	<u> </u>	11.47	8.57	-	7.24	7.82	10.		13.64	17.3	2	20.22	21.	55	]	(67)
		ains (calc												_				I	
(68)m=	232.68	<u> </u>	229.0	-	216.06	199.71	<b>1</b>	84.34	174.07	5a), 171		177.74	190.	7	207.05	222	12	1	(68)
				_			L							<u> </u>	207.05	222	.42	l	(00)
	<u> </u>	s (calcula		-i			-								25.00	05		1	(60)
(69)m=	35.88	35.88	35.88		35.88	35.88	3	85.88	35.88	35.	88	35.88	35.8	5	35.88	35.	88		(69)
		ans gains	r –	€ 5a			-									<del> </del>		1	
(70)m=	0	0	0		0	0		0	0	0		0	0		0	0	)		(70)
	<u> </u>	vaporatic	<u> </u>	·		, <b>`</b>	-	,										1	
(71)m=	-103.05	-103.05	-103.0	5	-103.05	-103.05	-1	03.05	-103.05	-103	.05	-103.05	-103.0	)5	-103.05	-103	.05		(71)
Water		g gains (T	able 5	5)			-					-							
(72)m=	132.64	130.32	125.5	5	118.95	114.7	1	08.72	103.63	110	.15	112.46	119.2	24	126.89	130	.33		(72)
Total i	nterna	l gains =						(66)	m + (67)m	1 + (68	3)m +	⊦ (69)m + (	(70)m +	· (7'	1)m + (72)	m			
(73)m=	447.93	445.68	431.3	3	408.12	384.63	3	61.94	347.17	353	.61	365.49	388.	9	415.8	435	.94		(73)
6. So	lar gain	IS:																	
		calculated	•	olar	flux from	Table 6a	and			tions	to co	onvert to th	ie appli	cab		ion.			
Orienta		Access F			Area m <sup>2</sup>			Flu	x ole 6a		Ŧ	g_ able 6b		т.	FF			Gains	
		Table 6d													able 6c			(W)	-
	ast <mark>0.9x</mark>			x	6.	1	x	3	6.79	x		0.63	x	L	0.7		=	68.56	(77)
Southe	ast <mark>0.9x</mark>	0.77		x	6.	1	x	6	2.67	x		0.63	×		0.7		=	116.78	(77)
Southe	ast <mark>0.9x</mark>	0.77		x	6.	1	x	8	5.75	x		0.63	×		0.7		=	159.78	(77)
Southe	ast <mark>0.9x</mark>	0.77		x	6.	1	x	10	06.25	x		0.63	x		0.7		=	197.98	(77)
Southe	ast <mark>0.9x</mark>	0.77		x	6.	1	x	1	19.01	x		0.63	x		0.7		=	221.76	(77)

													_
Southeast 0.9x	0.77	x	6.1		× 1	18.15	x	0.63	x	0.7	=	220.15	(77)
Southeast 0.9x	0.77	x	6.1		x 1	13.91	x	0.63	x	0.7	=	212.25	(77)
Southeast 0.9x	0.77	x	6.1		<b>x</b> 1	04.39	x	0.63	x	0.7	=	194.51	(77)
Southeast 0.9x	0.77	x	6.1		x g	92.85	x	0.63	x	0.7	=	173.01	(77)
Southeast 0.9x	0.77	x	6.1		x	69.27	x	0.63	x	0.7	=	129.07	(77)
Southeast 0.9x	0.77	x	6.1		x	44.07	x	0.63	x	0.7	=	82.12	(77)
Southeast 0.9x	0.77	x	6.1		<b>x</b> ;	31.49	x	0.63	x	0.7	=	58.67	(77)
Southwest <sub>0.9x</sub>	0.77	x	6.07	,	x :	36.79	]	0.63	x	0.7	=	68.31	(79)
Southwest <sub>0.9x</sub>	0.77	x	6.07	,	x	62.67	]	0.63	x	0.7	=	116.36	(79)
Southwest0.9x	0.77	x	6.07	,	x 8	35.75	]	0.63	x	0.7	=	159.21	(79)
Southwest <sub>0.9x</sub>	0.77	x	6.07	,	x 1	06.25	]	0.63	x	0.7	=	197.27	(79)
Southwest <sub>0.9x</sub>	0.77	x	6.07	,	x 1	19.01	]	0.63	x	0.7	=	220.96	(79)
Southwest <sub>0.9x</sub>	0.77	x	6.07	7	x 1	18.15	]	0.63	x	0.7	=	219.36	(79)
Southwest <sub>0.9x</sub>	0.77	x	6.07	,	x 1	13.91	]	0.63	x	0.7	=	211.48	(79)
Southwest <sub>0.9x</sub>	0.77	x	6.07	,	x 1	04.39		0.63	x	0.7	=	193.81	(79)
Southwest <sub>0.9x</sub>	0.77	x	6.07	,	x	92.85	]	0.63	x	0.7	=	172.39	(79)
Southwest <sub>0.9x</sub>	0.77	x	6.07	,	x (	69.27	]	0.63	x	0.7	=	128.6	(79)
Southwest <sub>0.9x</sub>	0.77	x	6.07	7	x	44.07		0.63	x	0.7	=	81.82	(79)
Southwest <sub>0.9x</sub>	0.77	x	6.07	7	x :	31.49	]	0.63	x	0.7	=	58.46	(79)
Northwest 0.9x	0.77	x	4.58	3	x	11.28	x	0.63	x	0.7	=	15.79	(81)
Northwest 0.9x	0.77	x	4.58	3	x	22.97	x	0.63	x	0.7	=	32.14	(81)
Northwest 0.9x	0.77	x	4.58	3	x	41.38	x	0.63	x	0.7	=	57.91	(81)
Northwest 0.9x	0.77	x	4.58	3	x	67.96	x	0.63	x	0.7	=	95.1	(81)
Northwest 0.9x	0.77	x	4.58	3	x	91.35	x	0.63	x	0.7	=	127.83	(81)
Northwest 0.9x	0.77	x	4.58	3	x	97.38	x	0.63	x	0.7	=	136.28	(81)
Northwest 0.9x	0.77	x	4.58	3	x	91.1	x	0.63	x	0.7	=	127.49	(81)
Northwest 0.9x	0.77	x	4.58	3	x	72.63	x	0.63	x	0.7	=	101.63	(81)
Northwest 0.9x	0.77	x	4.58	3	x !	50.42	x	0.63	x	0.7	=	70.56	(81)
Northwest 0.9x	0.77	x	4.58	3	x	28.07	x	0.63	x	0.7	=	39.28	(81)
Northwest 0.9x	0.77	x	4.58	3	x	14.2	x	0.63	x	0.7	=	19.87	(81)
Northwest 0.9x	0.77	x	4.58	3	x	9.21	x	0.63	x	0.7	=	12.89	(81)
Solar gains in		ulated	î				(83)m	n = Sum(74)m .	(82)m			1	
(83)m= 152.66		376.9		570.54	575.79	551.22	489	.96 415.96	296.95	5 183.81	130.03		(83)
Total gains –	<u>г г</u>	1		. ,	· ,		·			-1		1	()
(84)m= 600.59	710.96	808.2	898.47	955.17	937.73	898.39	843	.57 781.45	685.85	5 599.61	565.97		(84)
7. Mean inte	rnal temper	rature (	heating	season	)								
Temperature	e during hea	ating pe	eriods in	the livir	ng area	from Tal	ole 9,	, Th1 (°C)				21	(85)
Utilisation fa	ctor for gair	ns for li	ving area	a, h1,m	(see Ta	able 9a)				_		1	
I .	Feb	Mar	Apr	May	Jun	Jul	A	ug Sep	Oct	Nov	Dec		
Jan			,										
(86)m= 0.94	0.91	0.85	0.74	0.6	0.45	0.33	0.3	0.56	0.79	0.91	0.95		(86)
	0.91								0.79	0.91	0.95		(86)
(86)m= 0.94	0.91 al temperati							able 9c)	0.79 20.57		0.95		(86) (87)

Temp	erature	during h	neating p	periods ir	n rest of	dwelling	from Ta	ble 9, T	h2 (°C)					
=m(88)	20.23	20.23	20.23	20.25	20.25	20.26	20.26	20.26	20.26	20.25	20.24	20.24		(88)
Utilisa	ation fac	tor for g	ains for	rest of d	welling,	h2,m (se	e Table	9a)						
(89)m=	0.94	0.9	0.83	0.72	0.57	0.4	0.28	0.31	0.51	0.76	0.9	0.95		(89)
Mean	interna	l temper	ature in	the rest	of dwelli	ing T2 (f	ollow ste	eps 3 to 3	7 in Tabl	e 9c)				
(90)m=	18.26	18.67	19.19	19.74	20.06	20.22	20.25	20.25	20.16	19.73	18.93	18.19		(90)
						•			f	LA = Livin	g area ÷ (4	4) =	0.34	(91)
Mean	interna	l temper	ature (fo	or the wh	ole dwe	llina) = fl	LA x T1	+ (1 – fL	_A) × T2					_
(92)m=	18.7	19.07	19.54	20.03	20.33	20.47	20.51	20.5	20.42	20.02	19.3	18.64		(92)
Apply	adjustn	nent to t	he mear	n internal	temper	ature fro	m Table	4e, whe	ere appro	opriate				
(93)m=	18.7	19.07	19.54	20.03	20.33	20.47	20.51	20.5	20.42	20.02	19.3	18.64		(93)
8. Sp	ace hea	ting requ	uirement	t										
			ternal ter	•		ned at ste	ep 11 of	Table 9	b, so tha	t Ti,m=(	76)m an	d re-calc	ulate	
the ut	Jan	Feb	or gains Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa			ains, hm	· ·	iviay	Jun	Jui	Aug	Sep	001	NUV	Dec		
(94)m=	0.92	0.88	0.81	0.71	0.57	0.41	0.29	0.33	0.52	0.75	0.88	0.93		(94)
	l gains,	hmGm	, W = (94	۱ 4)m x (8	1 4)m									
(95)m=	552.19	624.41	658.48	637.27	, 545.29	388.12	264.06	275.17	405.6	514.65	528.35	526.05		(95)
Month	nly aver	age exte	ernal tem	perature	from Ta	able 8		1						
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat			an intern	· · ·		1			r í í	-				
(97)m=		1012.23		778.26	601.29	402.01	267.35	279.84	435.6	656.4	856.13	1020.58		(97)
-			ement fo	1		1	1		1		·	007.00		
(98)m=	357	260.62	200.55	101.52	41.66	0	0	0	0	105.46	236.01	367.93	4070 75	
_								lota	al per year	(kwh/yeai	r) = Sum(9)	8)15,912 =	1670.75	(98)
Space	e heatin	g require	ement in	kWh/m <sup>2</sup>	/year								19.29	(99)
9b. En	ergy rec	luiremer	nts – Cor	mmunity	heating	scheme								
•		•	bace hea	• •		-		• •	•		unity scł	neme.		(301)
			from se			-	•		1) 0 11 11	one			0	4
Fractio	n of spa	ace heat	from co	mmunity	system	1 – (30′	1) =						1	(302)
			y obtain he s, geotheri							up to four	other heat	sources; ti	he latter	
			S, geoinen Commun			ioni powei	Stations.	See Appel	nuix C.				1	(303a)
			heat fro	•		oilers				(3	02) x (303	a) =	1	(304a)
		•	charging		•		r commi	inity hes	atina sve		,(	/	1	(305)
			(Table 1					-	anig sys					(306)
				120/1010	Jonninun	ity neatin	ig syste						1.05	
-	heating space	-	requiren	nent									<b>kWh/yea</b> r 1670.75	
	-	-	' munity b						(98) x (30	04a) x (30	5) x (306) :	=	1754.29	 (307a)
•			y/supple		heating	system	in % (fro	om Table					0	`_´ ](308
				y		5,500				- P C I GIA	-,		•	

Space heating requirement from second	dary/supplementary system	(98) x (301) x 1	00 ÷ (308) =	0	(309)
Water heating Annual water heating requirement				2230.63	]
If DHW from community scheme: Water heat from Community boilers		(64) x (303a) x	(305) x (306) =	2342.16	(310a)
Electricity used for heat distribution		0.01 × [(307a)(307	'e) + (310a)(310e)] =	40.96	(313)
Cooling System Energy Efficiency Ratio	)			0	(314)
Space cooling (if there is a fixed cooling	system, if not enter 0)	= (107) ÷ (314)	=	0	(315)
Electricity for pumps and fans within dw mechanical ventilation - balanced, extra		tside		336.77	(330a)
warm air heating system fans				0	(330b)
pump for solar water heating				0	(330g)
Total electricity for the above, kWh/year		=(330a) + (330	b) + (330g) =	336.77	(331)
Energy for lighting (calculated in Append	dix L)			370.34	(332)
Electricity generated by PVs (Appendix	M) (negative quantity)			-872.75	(333)
Electricity generated by wind turbine (Ap	opendix M) (negative quant	ity)		0	(334)
12b. CO2 Emissions – Community heat	ing scheme				-
		Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
CO2 from other sources of space and w Efficiency of heat source 1 (%)	vater heating (not CHP) If there is CHP using tw	kWh/year	kg CO2/kWh	kg CO2/year	(367a)
	If there is CHP using tw	kWh/year	kg CO2/kWh (366) for the second fue	kg CO2/year	(367a) (367)
Efficiency of heat source 1 (%)	If there is CHP using tw	<b>kWh/year</b> o fuels repeat (363) to 0b)] x 100 ÷ (367b) x	kg CO2/kWh (366) for the second fue 0.22 =	kg CO2/year	J
Efficiency of heat source 1 (%) CO2 associated with heat source 1	If there is CHP using tw [(307b)+(310 [(31	<b>kWh/year</b> o fuels repeat (363) to 0b)] x 100 ÷ (367b) x	kg CO2/kWh (366) for the second fue 0.22 = 0.52 =	kg CO2/year 94 = 941.31	](367)
Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution	If there is CHP using tw [(307b)+(310 [(31 ystems (363	<b>kWh/year</b> o fuels repeat (363) to Db)] x 100 ÷ (367b) x 3) x 3)(366) + (368)(372	kg CO2/kWh (366) for the second fue 0.22 = 0.52 = 2) =	kg CO2/year 94 = 941.31 = 21.26	(367) (372)
Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community s	If there is CHP using tw [(307b)+(310 [(31 ystems (363 condary) (305	<b>kWh/year</b> o fuels repeat (363) to Ob)] x 100 ÷ (367b) x 3) x 3)(366) + (368)(372 9) x	kg CO2/kWh         (366) for the second fue         0.22         0.52         2)         0	kg CO2/year 94 = 941.31 = 21.26 = 962.57	(367) (372) (373)
Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community s CO2 associated with space heating (see	If there is CHP using tw [(307b)+(310 [(31 ystems (363 condary) (309 sion heater or instantaneous	<b>kWh/year</b> o fuels repeat (363) to Ob)] x 100 ÷ (367b) x 3) x 3)(366) + (368)(372 9) x	kg CO2/kWh         (366) for the second fue         0.22         0.52         2)         0	kg CO2/year 94 = 941.31 = 21.26 = 962.57 = 0	(367) (372) (373) (374)
Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community s CO2 associated with space heating (see CO2 associated with water from immers	If there is CHP using tw [(307b)+(310 [(31 ystems (363 condary) (309 sion heater or instantaneous rater heating (373	kWh/year o fuels repeat (363) to 0b)] x 100 ÷ (367b) x 3) x 3)(366) + (368)(372 9) x s heater (312) x 3) + (374) + (375) =	kg CO2/kWh (366) for the second fue 0.22 = 0.52 = 2) = 0 = 0.22 =	kg CO2/year 94 = 941.31 = 21.26 = 962.57 = 0 = 0	(367) (372) (373) (374) (375)
Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community s CO2 associated with space heating (see CO2 associated with water from immers Total CO2 associated with space and w	If there is CHP using tw [(307b)+(310 [(31 ystems (363 condary) (309 sion heater or instantaneous rater heating (373 os and fans within dwelling	kWh/year o fuels repeat (363) to 0b)] x 100 ÷ (367b) x 3) x 3)(366) + (368)(372 9) x s heater (312) x 3) + (374) + (375) =	kg CO2/kWh         (366) for the second fue         0.22         0.52         0         0.52         0         0.22         0         0.52         1         0.52         1         0.52         1         0.52	kg CO2/year 94 94 94 94 94 94 94 94 962.57 0 962.57 962.57	(367) (372) (373) (374) (375) (376)
Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community s CO2 associated with space heating (see CO2 associated with water from immers Total CO2 associated with space and w CO2 associated with electricity for pump	If there is CHP using tw [(307b)+(310 [(31 ystems (363 condary) (309 sion heater or instantaneous rater heating (373 os and fans within dwelling ng (332	kWh/year o fuels repeat (363) to 0b)] x 100 ÷ (367b) x 3) x 3)(366) + (368)(372 9) x s heater (312) x 3) + (374) + (375) = (331)) x 2))) x	kg CO2/kWh         (366) for the second fue         0.22         0.52         0         0.52         0         0.22         0         0.52         1         0.52         1         0.52	kg CO2/year 91 94 941.31 941.31 962.57 962.57 962.57 174.78	(367) (372) (373) (374) (375) (376) (378)
Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community s CO2 associated with space heating (see CO2 associated with space heating (see CO2 associated with space and w CO2 associated with electricity for pump CO2 associated with electricity for lightin Energy saving/generation technologies	If there is CHP using tw [(307b)+(310 [(31 ystems (363 condary) (309 sion heater or instantaneous rater heating (373 os and fans within dwelling ng (332	kWh/year o fuels repeat (363) to 0b)] x 100 ÷ (367b) x 3) x 3)(366) + (368)(372 9) x s heater (312) x 3) + (374) + (375) = (331)) x 2))) x	kg CO2/kWh         (366) for the second fue         0.22         0.52         0         0.52         0         0.52         0         0.52         1         0.52         1         0.52         1         0.52         1         0.52	kg CO2/year 94 94 94 94 94 94 94 94 94 94	(367) (372) (373) (374) (375) (376) (376) (378) (379)
Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community s CO2 associated with space heating (see CO2 associated with space heating (see CO2 associated with space and w CO2 associated with electricity for pump CO2 associated with electricity for pump CO2 associated with electricity for lightin Energy saving/generation technologies Item 1	If there is CHP using tw [(307b)+(310 [(31 uystems (363 condary) (306 sion heater or instantaneous rater heating (373 os and fans within dwelling ng (332 (333) to (334) as applicable	kWh/year o fuels repeat (363) to 0b)] x 100 ÷ (367b) x 3) x 3)(366) + (368)(372 9) x s heater (312) x 3) + (374) + (375) = (331)) x 2))) x	kg CO2/kWh         (366) for the second fue         0.22         0.52         0         0.52         0         0.52         0         0.52         1         0.52         1         0.52         1         0.52         1         0.52	kg CO2/year 94 94 94 94 94 94 94 94 94 94	(367) (372) (373) (374) (375) (376) (376) (378) (379) (380)

### SAP 2012 Overheating Assessment

Calculated by Stroma FSAP 2012 program, produced and printed on 28 October 2020

Property Details: Plot 19

Dwelling type: Located in: Region: Cross ventilation pos Number of storeys: Front of dwelling face Overshading: Overhangs: Thermal mass parame Night ventilation: Blinds, curtains, shut Ventilation rate during Overheating Details:	es: eter: ters:	ather (a	ch):	Flat England Thames va Yes 1 North East Average or None Indicative Y False 6 ( Window	unknown			
Summer ventilation h Transmission heat los Summer heat loss co	ss coeffi	cient:	ent:	428.67 51.6 480.23				(P1) (P2)
Overhangs:								
<b>Orientation:</b> South East (SE) South West (SW) North West (NW)	<b>Ratio:</b> 0 0 0		<b>Z_overhangs:</b> 1 1 1					
Solar shading:								
Orientation: South East (SE) South West (SW) North West (NW)	<b>Z blind</b> 1 1 1	ls:	<b>Solar access:</b> 0.9 0.9 0.9	<b>Over</b> 1 1 1	hangs:	<b>Z summer:</b> 0.9 0.9 0.9		(P8) (P8) (P8)
Solar gains: Orientation South East (SE) South West (SW) North West (NW) Internal gains:	0.9 x 0.9 x 0.9 x	<b>Area</b> 6.1 6.07 4.58	<b>Flux</b> 119.92 119.92 98.85	<b>g_</b> 0.63 0.63 0.63	<b>FF</b> 0.7 0.7 0.7	<b>Shading</b> 0.9 0.9 0.9 <b>Total</b>	<b>Gains</b> 261.18 260.24 161.68 683.09	(P3/P4)
Internal gains Total summer gains Summer gain/loss ratio Mean summer external Thermal mass tempera Threshold temperature <b>Likelihood of high int</b>	tempera ture incre ernal ten	ement n <b>peratu</b>	re	2.5 16 1.3 19 <b>No</b>	6.5 28.4 56 .86 <b>.86</b> <b>it significant</b>	<b>July</b> 487.55 1170.64 2.44 17.9 1.3 21.64 <b>Slight</b>	August 496.32 1115.01 2.32 17.8 1.3 21.42 Slight	
Assessment of likelih	ood of h	igh inte	rnal temperatur	re: <u>Slie</u>	<u>ght</u>			

		User I	Details:						
Assessor Name:	Zahid Ashraf	_	Stroma					001082	
Software Name:	Stroma FSAP 2012		Softwa		sion:		Versio	n: 1.0.5.9	
A dalaa a a		Property	Address:	Plot 19					
Address : 1. Overall dwelling dime	nsions:								
		Δre	a(m²)			ight(m)		Volume(m <sup>3</sup> )	
Ground floor				(1a) x	<b></b>	2.5	(2a) =	216.5	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)	)+(1n)	86.6	(4)					
Dwelling volume				(3a)+(3b)	+(3c)+(3d	l)+(3e)+	.(3n) =	216.5	(5)
2. Ventilation rate:							-		_
		condary eating	other		total			m <sup>3</sup> per hour	
Number of chimneys			0	] = [	0	<b>x</b> 4	40 =	0	(6a)
Number of open flues	0 +	0 +	0	=	0	x 2	20 =	0	(6b)
Number of intermittent fa	ins				3	<b>x</b> 1	0 =	30	(7a)
Number of passive vents	\$			Г	0	x 1	0 =	0	(7b)
Number of flueless gas f	ires			Ē	0	x 4	40 =	0	(7c)
							Air ch	anges per ho	ur
Infiltration due to chimne	exs flues and fans = (6a)	ı)+(6b)+(7a)+(7b)+	(7c) =	Г	30		÷ (5) =	0.14	(8)
	been carried out or is intended			ontinue fro			. (0) –	0.14	
Number of storeys in t	he dwelling (ns)							0	(9)
Additional infiltration						[(9)-	1]x0.1 =	0	(10)
	0.25 for steel or timber fi			•	uction			0	(11)
if both types of wall are p deducting areas of openi	resent, use the value corresp nas): if equal user 0.35	oonding to the grea	iter wall area	a (after					
	floor, enter 0.2 (unseale	ed) or 0.1 (seal	ed), else	enter 0				0	(12)
lf no draught lobby, en	iter 0.05, else enter 0							0	(13)
Percentage of window	s and doors draught str	ipped						0	(14)
Window infiltration			0.25 - [0.2	x (14) ÷ 10	= [00			0	(15)
Infiltration rate			(8) + (10) -	+ (11) + (1	2) + (13) -	+ (15) =		0	(16)
	q50, expressed in cubi	•	•	•	etre of e	nvelope	area	3	(17)
If based on air permeabil					. , .			0.29	(18)
Number of sides sheltere	es if a pressurisation test has	been done or a de	gree air pei	meability i	s being u	sed		4	(19)
Shelter factor			(20) = 1 - [	0.075 x (1	9)] =			0.92	(19)
Infiltration rate incorporation	ting shelter factor		(21) = (18)	x (20) =				0.27	(21)
Infiltration rate modified f	•							0.2.	
Jan Feb	Mar Apr May	Jun Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	beed from Table 7								
(22)m= 5.1 5	4.9 4.4 4.3	3.8 3.8	3.7	4	4.3	4.5	4.7		
Wind Factor $(22a)m = (2$	2)m ÷ 4								
(22a)m= 1.27 1.25	1.23         1.1         1.08	0.95 0.95	0.92	1	1.08	1.12	1.18		

Adjuste	ed infiltr	ation rat	e (allowi	ng for sh	nelter an	d wind s	peed) =	(21a) x	(22a)m		-				
<b>.</b>	0.34	0.33	0.33	0.29	0.29	0.25	0.25	0.25	0.27	0.29	0.3	0.31			
		<i>ctive air i</i> al ventila	-	rate for t	he appli	cable ca	se								(23a)
				endix N (2	3b) = (23a	i) x Fmv (e	equation (N	√5)) , other	wise (23h	) = (23a)			0		
								n Table 4h)		) = (200)			0		(23b) (23c)
			-	-	-					2h)m ± (	23P) ^ [	1 – (23c)			(230)
(24a)m=				0	0			0	0			1 - (230)	÷ 100]		(24a)
		-	-	÷	-	÷	÷	́ ЛV) (24b	÷			ů			
(24b)m=	0			0	0				0		0	0			(24b)
	-	-	-	tilation o	-	-	ventilatio	on from c	utside						. ,
					•	•		c) = (22b		.5 × (23b	<b>)</b> )				
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0			(24c)
d) If	natural	ventilatio	on or wh	ole hous	e positiv	/e input v	ventilatio	on from I	oft	!		<u>.</u>			
i	if (22b)n	n = 1, the	en (24d)	m = (22t	o)m othe	rwise (2	4d)m = 0	0.5 + [(2	2b)m² x	0.5]			L		
(24d)m=	0.56	0.56	0.55	0.54	0.54	0.53	0.53	0.53	0.54	0.54	0.55	0.55			(24d)
Effe	ctive air	change	rate - er	nter (24a	) or (24b	o) or (24	c) or (24	d) in box	(25)						
(25)m=	0.56	0.56	0.55	0.54	0.54	0.53	0.53	0.53	0.54	0.54	0.55	0.55			(25)
3. He	at losse	s and he	eat loss p	paramete	er:										
ELEN	IENT	Gros	SS	Openin	gs	Net Ar	ea	U-valu		ΑXU		k-value		ΑX	
		area	(m²)	m	2	A ,r	n²	W/m2	К	(W/I	K)	kJ/m²∙ł	<	kJ/ŀ	<
Doors						2	X	1.4	=	2.8					(26)
Windo	ws Type	e 1				6.097	x1,	/[1/( 1.4 )+	0.04] =	8.08					(27)
Window	ws Type	e 2				6.075	5 x1,	/[1/( 1.4 )+	0.04] =	8.05					(27)
Windo	ws Type	93				4.579	) x1,	/[1/( 1.4 )+	0.04] =	6.07					(27)
Floor						9.39	x	0.12	=	1.1268					(28)
Walls 7	Type1	78.7	′5	16.75	5	62	x	0.15	=	9.3					(29)
Walls 7	Type2	14.3	37	2		12.37	' X	0.14	=	1.75			$\neg \Box$		(29)
Walls <sup>-</sup>	ТуреЗ	12.5	6	0		12.56	3 X	0.13	=	1.66	i F		<b>-</b> -		(29)
Total a	rea of e	lements	, m²			115.0	8								(31)
* for win	dows and	roof wind	ows, use e	ffective wi	ndow U-va	alue calcul	ated using	formula 1,	/[(1/U-valu	ıe)+0.04] a	as given in	paragraph	3.2		
		as on both			s and part	titions		·	()						-
		ss, W/K =		U)				(26)(30)					38.8	5	(33)
		Cm = S(	,							(30) + (32	· · · ·	(32e) =	1921	35	(34)
		parame			,					tive Value			100	)	(35)
	-	sments wh ad of a dei			constructi	on are not	t known pr	ecisely the	e indicative	e values of	IMP in T	able 1f			
Therm	al bridge	es : S (L	x Y) cal	culated u	using Ap	pendix ł	<						12.7	1	(36)
if details	of therma	al bridging	are not kn	own (36) =	= 0.05 x (3	1)									<b>J</b> , ,
Total fa	abric he	at loss							(33) +	(36) =			51.5	6	(37)
Ventila	tion hea	at loss ca	alculated	monthly	/				(38)m	= 0.33 × (	25)m x (5	)			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
(38)m=	39.86	39.7	39.54	38.8	38.66	38.02	38.02	37.9	38.27	38.66	38.94	39.24			(38)
Heat tr	ansfer o	coefficier	nt, W/K						(39)m	= (37) + (3	38)m				
(39)m=	91.42	91.26	91.1	90.36	90.22	89.58	89.58	89.46	89.82	90.22	90.5	90.79			_
Stroma I	FSAP 201	2 Version:	1.0.5.9 (S	SAP 9.92)	http://ww	w.stroma.c	com			Average =	Sum(39)	12 /12=	90.3	Page 2	<mark>∳{3</mark> ,9)

Heat lo	oss para	meter (H	HLP), W	/m²K					(40)m	= (39)m ÷	- (4)			
(40)m=	1.06	1.05	1.05	1.04	1.04	1.03	1.03	1.03	1.04	1.04	1.05	1.05		
Numbe	er of day	/s in mo	nth (Tab	le 1a)	•	•	•		,	Average =	Sum(40)1.	.12 /12=	1.04	(40)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Wa	ater hea	ting ene	rgy requ	irement:								kWh/ye	ear:	
if TF				: [1 - exp	(-0.0003	349 x (TF	FA -13.9	9)2)] + 0.0	0013 x ( <sup>-</sup>	TFA -13.	2. .9)	58	l	(42)
Annua <i>Reduce</i>	l averag	je hot wa al average	hot water	usage by		welling is	designed	(25 x N) to achieve		se target o		).41		(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate					Vd,m = fa									
(44)m=	110.45	106.43	102.41	98.4	94.38	90.37	90.37	94.38	98.4	102.41	106.43	110.45		
_											m(44) <sub>112</sub> =		1204.88	(44)
					-			DTm / 3600		·		-	I	
(45)m=	163.79	143.25	147.82	128.88	123.66	106.71	98.88	113.47	114.82	133.81	146.07	158.62		
lf instant	taneous w	vater heati	ng at point	t of use (no	o hot water	r storage),	enter 0 in	boxes (46		Total = Su	m(45) <sub>112</sub> =	:	1579.79	(45)
(46)m=	0	0	0	0	0	0	0	0	0	0	0	0		(46)
	storage		!	!	!	!	!	1	!	!	·			
-		. ,		• •			-	within sa	ame ves	sel	(	0		(47)
	•	-			velling, e			ı (47) ombi boil	ars) ante	ər '()' in <i>(</i>	(17)			
	storage		not wat	51 (ti 115 11		nstantai								
a) If m	anufact	urer's de	eclared I	oss facto	or is kno	wn (kWł	n/day):				(	0		(48)
Tempe	erature f	actor fro	m Table	2b							(	0		(49)
			•	e, kWh/ye				(48) x (49)	) =		(	C		(50)
				•	loss fact le 2 (kW									(54)
		•	ee secti			n/nne/ua	ay)				(	)		(51)
	•	from Ta									(	)		(52)
Tempe	erature f	actor fro	m Table	2b							(	0		(53)
Energy	/ lost fro	m water	r storage	e, kWh/ye	ear			(47) x (51)	) x (52) x (	53) =	(	)		(54)
Enter	(50) or	(54) in (5	55)								(	0		(55)
Water	storage	loss cal	culated	for each	month	-	-	((56)m = (	55) × (41)	m				
(56)m=	0	0	0	0	0	0	0	0	0	0	0	0		(56)
If cylinde	er contain	s dedicate	d solar sto	orage, (57)	m = (56)m	x [(50) – (	H11)] ÷ (5	50), else (5	7)m = (56)	m where (	H11) is fro	m Append	lix H	
(57)m=	0	0	0	0	0	0	0	0	0	0	0	0		(57)
Primar	y circuit	loss (ar	nnual) fro	om Table	e 3						(	0		(58)
	•						. ,	65 × (41)						
•		· · · · · ·		I	· · · · ·	· · · · · ·	· · · · · ·	ng and a	· ·	· · · · · ·	, 	-	I	
(59)m=	0	0	0	0	0	0	0	0	0	0	0	0		(59)

$ \begin{array}{c} (62) m= & 139.22 & 121.76 & 125.65 & 109.54 & 105.11 & 90.7 & 84.05 & 96.45 & 97.6 & 113.74 & 124.16 & 134.83 \\ \text{Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating) (add additional lines if FGHRS and/or WWHRS applies, see Appendix G) (63) m= \begin{array}{c} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 $
Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating) (add additional lines if FGHRS and/or WWHRS applies, see Appendix G) (63)m= $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$
(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)       (63)m=       0
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$
Output from water heater         (64)m= $139.22$ 121.76 125.65 109.54 105.11 90.7 84.05 96.45 97.6 113.74 124.16 134.83 Output from water heater (annual)12 1342.82 (64)         Heat gains from water heating, kWh/month 0.25 $' [0.85 \times (45)m + (61)m] + 0.8 \times [(46)m + (57)m + (59)m]$ (65)m= $34.81$ $30.44$ $31.41$ $27.39$ $26.28$ $22.68$ $21.01$ $24.11$ $24.4$ $28.44$ $31.04$ $33.71$ (65)         include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating         5. Internal gains (see Table 5 and 5a):         Mar Apr May Jun Jul Aug Sep Oct Nov Dec         Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec         (66)m= 128.81 12
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$
Output from water heater (annual)       1342.82       (64)         Heat gains from water heating, kWh/month $0.25 \cdot [0.85 \times (45)m + (61)m] + 0.8 \times [(46)m + (57)m + (59)m]$ (65)m=       34.81       30.44       31.41       27.39       26.28       22.68       21.01       24.11       24.4       28.44       31.04       33.71       (65)         include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating         5. Internal gains (see Table 5 and 5a):         Metabolic gains (Table 5), Watts         [66)m=       128.81
Heat gains from water heating, kWh/month 0.25 $\begin{bmatrix} 0.85 \times (45)m + (61)m \end{bmatrix} + 0.8 \times [(46)m + (57)m + (59)m ]$ (65)m=       34.81       30.44       31.41       27.39       26.28       22.68       21.01       24.11       24.4       28.44       31.04       33.71       (65)         include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating       5.       Internal gains (see Table 5 and 5a):         Metabolic gains (Table 5), Watts
(65)m=       34.81       30.44       31.41       27.39       26.28       22.68       21.01       24.11       24.4       28.44       31.04       33.71       (65)         include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating       5.       Internal gains (see Table 5 and 5a):         Metabolic gains (Table 5), Watts
include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating         5. Internal gains (see Table 5 and 5a):         Metabolic gains (Table 5), Watts         Jan       Feb       Mar       Apr       May       Jun       Jul       Aug       Sep       Oct       Nov       Dec         (66)m=       128.81
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec         (66)m=       128.81       128.81       128.81       128.81       128.81       128.81       128.81       128.81       128.81       128.81       166         Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5       (67)m=       20.97       18.63       15.15       11.47       8.57       7.24       7.82       10.16       13.64       17.32       20.22       21.55       (67)
Metabolic gains (Table 5), Watts         Jan       Feb       Mar       Apr       May       Jun       Jul       Aug       Sep       Oct       Nov       Dec         (66)m=       128.81
Metabolic gains (Table 5), Watts         Jan       Feb       Mar       Apr       May       Jun       Jul       Aug       Sep       Oct       Nov       Dec         (66)m=       128.81
Jan         Feb         Mar         Apr         May         Jun         Jul         Aug         Sep         Oct         Nov         Dec           (66)m=         128.81
(66)m=       128.81
(67)m= 20.97 18.63 15.15 11.47 8.57 7.24 7.82 10.16 13.64 17.32 20.22 21.55 (67)
(67)m= 20.97 18.63 15.15 11.47 8.57 7.24 7.82 10.16 13.64 17.32 20.22 21.55 (67)
Appliances gains (calculated in Appendix L. equation 1.13 or 1.13a), also see Table 5
הטטוומווטבים טמוווים וטמוטטומובט ונו הטטבווטוג ב. בטטמווטון בדם טרבדסמו, מופט פביד מטובים
(68)m= 232.68 235.1 229.01 216.06 199.71 184.34 174.07 171.66 177.74 190.7 207.05 222.42 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5
(69)m=         35.88         35.88         35.88         35.88         35.88         35.88         35.88         35.88         35.88         (69)
Pumps and fans gains (Table 5a)
$ (70)m = \begin{array}{c c c c c c c c c c c c c c c c c c c $
Losses e.g. evaporation (negative values) (Table 5)
$ (71)m = \begin{bmatrix} -103.05 & -10$
Water heating gains (Table 5)
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$
Total internal gains = $(66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m$ (73)m=362.08360.66348.02327.21305.24284.71271.78275.88286.92307.88332.02350.92(73)
6. Solar gains:
Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.
Orientation: Access Factor Area Flux g_ FF Gains
Table 6dm²Table 6aTable 6bTable 6c(W)
Southeast 0.9x 0.77 x 6.1 x 36.79 x 0.63 x 0.7 = 68.56 (77)
Southeast $0.9x$ 0.77 x 6.1 x 62.67 x 0.63 x 0.7 = 116.78 (77)
Southeast $0.9x$ 0.77 x 6.1 x 85.75 x 0.63 x 0.7 = 159.78 (77)
Southeast $0.9x$ 0.77 x 6.1 x 106.25 x 0.63 x 0.7 = 197.98 (77)
Southeast $0.9x$ 0.77 x 6.1 x 119.01 x 0.63 x 0.7 = 221.76 (77)

								-			_				_
Southeast 0.9x	0.77	x	6.	1	x	1	18.15	x	0.63	)		0.7	=	220.15	(77)
Southeast 0.9x	0.77	x	6.	1	x	1	13.91	x	0.63	>	•	0.7	=	212.25	(77)
Southeast 0.9x	0.77	x	6.	1	x	1	04.39	x	0.63	)	۰ [	0.7	=	194.51	(77)
Southeast 0.9x	0.77	x	6.	1	x	9	92.85	x	0.63	)	۰ [	0.7	=	173.01	(77)
Southeast 0.9x	0.77	x	6.	1	x	6	9.27	x	0.63	)	۲ [	0.7	=	129.07	(77)
Southeast 0.9x	0.77	x	6.	1	x	4	4.07	x	0.63	)	•	0.7	=	82.12	(77)
Southeast 0.9x	0.77	x	6.	1	x	3	31.49	x	0.63	)	] ،	0.7	=	58.67	(77)
Southwest <sub>0.9x</sub>	0.77	x	6.0	)7	x	3	86.79	]	0.63	)	] ،	0.7	=	68.31	(79)
Southwest <sub>0.9x</sub>	0.77	x	6.0	07	x	6	62.67	]	0.63	)	] ،	0.7	=	116.36	(79)
Southwest0.9x	0.77	x	6.0	)7	x	8	85.75	]	0.63	)	• [	0.7	=	159.21	(79)
Southwest <sub>0.9x</sub>	0.77	x	6.0	17	x	1	06.25	]	0.63	)	۱ ،	0.7	=	197.27	(79)
Southwest <sub>0.9x</sub>	0.77	x	6.0	17	x	1	19.01	]	0.63	)	۱ ،	0.7	=	220.96	(79)
Southwest <sub>0.9x</sub>	0.77	x	6.0	17	x	1	18.15	]	0.63	)	(	0.7	=	219.36	(79)
Southwest <sub>0.9x</sub>	0.77	x	6.0	17	x	1	13.91	]	0.63	)	۱ ،	0.7	=	211.48	(79)
Southwest <sub>0.9x</sub>	0.77	x	6.0	17	x	1	04.39	]	0.63	)	(	0.7	=	193.81	(79)
Southwest <sub>0.9x</sub>	0.77	x	6.0	)7	x	g	92.85	]	0.63	)	] ،	0.7	=	172.39	(79)
Southwest <sub>0.9x</sub>	0.77	x	6.0	17	x	6	9.27	]	0.63	)	(	0.7	=	128.6	(79)
Southwest <sub>0.9x</sub>	0.77	x	6.0	17	x	4	4.07	]	0.63	)	(	0.7	=	81.82	(79)
Southwest <sub>0.9x</sub>	0.77	x	6.0	)7	x	3	31.49	]	0.63	)	] ،	0.7	=	58.46	(79)
Northwest 0.9x	0.77	x	4.5	i8	x	1	1.28	×	0.63	)	] ،	0.7	=	15.79	(81)
Northwest 0.9x	0.77	x	4.5	i8	x	2	2.97	x	0.63	)	(	0.7	=	32.14	(81)
Northwest 0.9x	0.77	x	4.5	i8	x	4	1.38	x	0.63	)	] ،	0.7	=	57.91	(81)
Northwest 0.9x	0.77	x	4.5	i8	x	6	67.96	x	0.63	)	] ،	0.7	=	95.1	(81)
Northwest 0.9x	0.77	x	4.5	i8	x	g	91.35	×	0.63	)	] ،	0.7	=	127.83	(81)
Northwest 0.9x	0.77	x	4.5	i8	x	9	97.38	x	0.63	)	] ،	0.7	=	136.28	(81)
Northwest 0.9x	0.77	x	4.5	i8	x		91.1	x	0.63	)	] ،	0.7	=	127.49	(81)
Northwest 0.9x	0.77	x	4.5	8	x	7	2.63	x	0.63	)	۱ ،	0.7	=	101.63	(81)
Northwest 0.9x	0.77	x	4.5	8	x	5	50.42	x	0.63	)	۰ [	0.7	=	70.56	(81)
Northwest 0.9x	0.77	x	4.5	8	x	2	28.07	x	0.63	)	۔ ا	0.7	=	39.28	(81)
Northwest 0.9x	0.77	x	4.5	8	x		14.2	x	0.63	)	۔ ا	0.7	=	19.87	(81)
Northwest 0.9x	0.77	x	4.5	8	x		9.21	×	0.63	)	] ،	0.7	=	12.89	(81)
								-			-				_
Solar gains in	1 1	lculated	for eac		_		1	(83)m	i = Sum(74)r	m(82)	m			1	
(83)m= 152.66		376.9	490.35	570.54		75.79	551.22	489	.96 415.9	6 296	.95	183.81	130.03		(83)
Total gains –	1 1		. ,	· ,	<u>`</u>	,	· · · · · · · · · · · · · · · · · · ·							1	
(84)m= 514.74	625.94	724.92	817.55	875.78	8	860.5	823	765	.83 702.8	8 604	.83	515.83	480.94		(84)
7. Mean inte	rnal temp	erature	(heating	seaso	n)										
Temperature	during h	eating p	eriods ir	n the liv	ving	area	from Tab	ole 9	Th1 (°C)					21	(85)
Utilisation fac	ctor for ga	ains for I	iving are	ea, h1,r	n (s	ee Ta	ble 9a)							1	
Jan	Feb	Mar	Apr	May	′	Jun	Jul	A	ug Sep	<u> </u>	ct	Nov	Dec		
(86)m= 0.97	0.94	0.9	0.83	0.72		0.58	0.44	0.4	9 0.69	0.8	37	0.95	0.97	]	(86)
Mean interna	al tempera	ature in	living are	ea T1 (	follo	w ste	ps <u>3</u> to 7	7 in T	able 9c)					_	
(87)m= 18.8	19.12	19.58	20.11	20.55	2	20.83	20.94	20.	92 20.71	l 20.	12	19.35	18.74		(87)

Tomo	oroturo	during k		oriodo ir	root of	طبيرمالنمم	from To		$h_{0} (0 \cap)$					
(88)m=		20.04	neating p	20.05	20.05	20.05	20.05	20.06	20.05	20.05	20.05	20.04		(88)
									20.05	20.00	20.00	20.04		(00)
	-		ains for	i		· · · ·	i		0.00	0.05	0.04	0.07		(20)
(89)m=	0.96	0.94	0.89	0.81	0.68	0.51	0.36	0.4	0.63	0.85	0.94	0.97		(89)
Mean	interna	l temper	rature in	the rest	of dwelli	ng T2 (fo	ollow ste	ps 3 to	7 in Tabl	e 9c)				
(90)m=	18.02	18.34	18.78	19.3	19.71	19.95	20.03	20.02	19.85	19.32	18.58	17.96		(90)
									f	iLA = Livin	g area ÷ (4	4) =	0.34	(91)
Mean	interna	l temper	rature (fo	or the wh	ole dwe	llina) = fl	A x T1	+ (1 – fl	A) x T2					
(92)m=	18.29	18.61	19.06	19.58	20	20.25	20.34	20.33	20.15	19.59	18.84	18.23		(92)
		i nent to t	he mear		l temper		ı m Table			opriate				
(93)m=	18.29	18.61	19.06	19.58	20	20.25	20.34	20.33	20.15	19.59	18.84	18.23		(93)
		I	uirement											· · ·
		, i	ternal ter		re obtain	ned at sta	an 11 of	Table Q	h sa tha	t Ti m-("	76)m an	d re-calc	ulata	
			or gains	•			ерттог		0, 50 ina	u 11,111–(1	r ojin an	u ie-caic	ulate	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa	ation fac	tor for g	i ains, hm	· ·										
(94)m=	0.95	0.92	0.87	0.79	0.68	0.52	0.39	0.43	0.64	0.83	0.93	0.96		(94)
Usefu	ul gains,	hmGm	, W = (94	4)m x (84	4)m	1								
(95)m=	<u> </u>		633	648.09	, 591.35	451.51	318.33	328.56	446.56	503.26	477.53	460.18		(95)
			rnal tem	perature	i e from Ta									
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
		e for me	an intern	l al tempe	erature	Im W=	L =[(39)m :	L x [(93)m	l – (96)m	1				
		1251.04	1	965.09	748.55	506.29	335.07	351.32	543.17	811.32	1062.75	1273.7		(97)
												_		
- <b>S</b> DAC	e heatin	a require	ement fo	r each n	nonth k\	Nh/mont	th = 0.02	24 x [(97	)m – (95	m x (4)	1)m			
		ř ·	1	1	i		i		)m – (95 0	í - ·	· · · · · · · · · · · · · · · · · · ·	605.26		
(98)m=	588	g require 453.7	ement fo 380.12	r each n 228.24	116.95	Wh/mont 0	h = 0.02	0	0	229.2	421.36	605.26	3022.83	(98)
(98)m=	588	453.7	380.12	228.24	116.95		i	0	Í	229.2	421.36		3022.83	(98)
(98)m=	588	453.7	1	228.24	116.95		i	0	0	229.2	421.36		3022.83 34.91	(98) (99)
(98)m=	588 e heatin	453.7 g require	380.12	228.24 kWh/m <sup>2</sup>	116.95		i	0	0	229.2	421.36			
(98)m= Space 8c. S	588 e heatin pace co	453.7 g require	380.12 ement in	228.24 kWh/m <sup>2</sup> nt	116.95 2/year	0	i	0	0	229.2	421.36			
(98)m= Space 8c. S	588 e heatin pace co	453.7 g require	380.12 ement in quiremer	228.24 kWh/m <sup>2</sup> nt	116.95 2/year	0	i	0	0	229.2	421.36			
(98)m= Space 8c. S Calcu	588 e heatin pace co ilated fo Jan	453.7 g require oling rec r June, Feb	380.12 ement in quiremen July and	228.24 kWh/m² nt August. Apr	116.95 ²/year See Tal May	0 ble 10b Jun	0 Jul	0 Tota Aug	0 al per year Sep	229.2 (kWh/year Oct	421.36 ) = Sum(9 Nov	8) <sub>15,912</sub> = Dec		
(98)m= Space 8c. S Calcu Heat (100)m=	588 e heatin pace co llated fo Jan loss rate	453.7 g require oling red r June, Feb e Lm (ca 0	380.12 ement in guiremen July and Mar alculated 0	228.24 kWh/m² nt August. Apr	116.95 ²/year See Tal May	0 ble 10b Jun	0 Jul	0 Tota Aug	0 al per year Sep	229.2 (kWh/year Oct	421.36 ) = Sum(9 Nov	8) <sub>15,912</sub> = Dec		
(98)m= Space 8c. S Calcu Heat (100)m=	588 e heatin pace co llated fo Jan loss rate	453.7 g require oling red r June, Feb e Lm (ca	380.12 ement in guiremen July and Mar alculated 0	228.24 kWh/m <sup>2</sup> nt August. Apr using 25	116.95 2/year See Tal May 5°C inter	0 ble 10b Jun mal temp	0 Jul perature	0 Tota Aug and ext	0 Il per year Sep ernal ten	229.2 (kWh/year Oct	421.36 ) = Sum(9 Nov e from T	8)15,912 = Dec able 10)		(100)
(98)m= Space 8c. S Calcu Heat (100)m=	588 e heatin pace co lated fo Jan loss rate 0 ation fac	453.7 g require oling red r June, Feb e Lm (ca 0	380.12 ement in guiremen July and Mar alculated 0	228.24 kWh/m <sup>2</sup> nt August. Apr using 25	116.95 2/year See Tal May 5°C inter	0 ble 10b Jun mal temp	0 Jul perature	0 Tota Aug and ext	0 Il per year Sep ernal ten	229.2 (kWh/year Oct	421.36 ) = Sum(9 Nov e from T	8)15,912 = Dec able 10)		(99)
(98)m= Space 8c. S Calcu Heat (100)m= Utilisa (101)m=	588 e heatin pace co llated fo Jan loss rate 0 ation fac	453.7 g require oling rec r June, Feb e Lm (ca 0 ctor for lo	380.12 ement in guiremen July and Mar alculated 0 oss hm	228.24 kWh/m <sup>2</sup> t August. Apr using 25 0	116.95 2/year See Tal May 5°C inter 0	0 ble 10b Jun nal temp 842.02 0.83	0 Jul Derature 662.87	0 Tota Aug and ext 679.88	0 Il per year Sep ernal ten 0	229.2 (kWh/year Oct nperatur	421.36 ) = Sum(9 Nov e from T 0	8)15,912 = Dec able 10) 0		(100)
(98)m= Space 8c. S Calcu Heat (100)m= Utilisa (101)m=	588 e heatin pace co lated fo Jan loss rate 0 ation fac	453.7 g require oling rec r June, Feb e Lm (ca 0 ctor for lo	380.12 ement in uiremen July and Mar alculated 0 oss hm 0	228.24 kWh/m <sup>2</sup> t August. Apr using 25 0	116.95 2/year See Tal May 5°C inter 0	0 ble 10b Jun nal temp 842.02 0.83	0 Jul Derature 662.87	0 Tota Aug and ext 679.88	0 Il per year Sep ernal ten 0	229.2 (kWh/year Oct nperatur	421.36 ) = Sum(9 Nov e from T 0	8)15,912 = Dec able 10) 0		(100)
(98)m= Space 8c. S Calcu Heat (100)m= Utilisa (101)m= Usefu (102)m=	588 e heatin pace co llated fo Jan loss rate 0 ation fac 0 ul loss, h	453.7 g require oling rec r June, Feb e Lm (ca 0 ctor for lc 0 mLm (V 0	380.12 ement in July and Mar alculated 0 oss hm 0 Vatts) = (	228.24 kWh/m <sup>2</sup> t August. Apr using 25 0 0 (100)m x 0	116.95 /year See Tal May 5°C inter 0 (101)m 0	0 ble 10b Jun nal temp 842.02 0.83	0 Jul perature 662.87 0.88 581.74	0 Tota Aug and extr 679.88 0.86 581.93	0 Il per year Sep ernal ten 0 0	229.2 (kWh/year Oct nperatur 0	421.36 ) = Sum(9 ) = from T 0	8)15,912 = Dec able 10) 0		(99) (100) (101)
(98)m= Space 8c. S Calcu Heat (100)m= Utilisa (101)m= Usefu (102)m=	588 e heatin pace co llated fo Jan loss rate 0 ation fac 0 ul loss, h 0 s (solar g	453.7 g require oling rec r June, Feb e Lm (ca 0 ctor for lc 0 mLm (V 0	380.12       ement in       guirement       July and       Mar       alculated       0       pss hm       0       Vatts) = (       0	228.24 kWh/m <sup>2</sup> t August. Apr using 25 0 0 (100)m x 0	116.95 /year See Tal May 5°C inter 0 (101)m 0	0 ble 10b Jun nal temp 842.02 0.83	0 Jul berature 662.87 0.88 581.74 egion, se	0 Tota Aug and extr 679.88 0.86 581.93 re Table	0 Il per year Sep ernal ten 0 0	229.2 (kWh/year Oct nperatur 0	421.36 ) = Sum(9 ) = from T 0	8)15,912 = Dec able 10) 0		(99) (100) (101)
(98)m= Space 8c. S Calcu Heat (100)m= Utilisa (101)m= Usefu (102)m= Gains (103)m= Space	588 e heatin pace co lated fo Jan loss rate 0 ation fac ation fac 0 ul loss, h 0 s (solar g 0 e cooling	453.7 g require oling req r June, Feb e Lm (ca 0 etor for lo 0 mLm (V 0 gains ca 0 g require	380.12 ement in quiremen July and Mar alculated 0 oss hm 0 Vatts) = ( 0 lculated 0 ement fo	228.24 kWh/m <sup>2</sup> August. Apr using 28 0 (100)m x 0 for appli 0 <i>r month,</i>	116.95 2/year See Tal May 5°C inter 0 (101)m 0 (101)m 0 cable we 0 whole c	0 ble 10b Jun nal temp 842.02 0.83 695.44 eather re 1102.28	0 Jul berature 662.87 0.88 581.74 egion, se 1056.45	0 Tota Aug and ext 679.88 0.86 581.93 e Table 991.26	0 Il per year Sep ernal ten 0 10) 0	229.2 (kWh/year Oct nperatur 0 0	421.36 ) = Sum(9 ) = Sum(9 ) e from T 0 0 0	8)15,912 = Dec able 10) 0 0	34.91	(100) (101) (102)
(98)m= Space 8c. S Calcu Heat (100)m= Utilisa (101)m= Usefu (102)m= Gains (103)m= <i>Spac</i> set (1	588 e heatin pace co llated fo Jan loss rate 0 ation fac 0 ul loss, h 0 s (solar s 0 e coolin 0 04)m to	453.7 g require oling red r June, C Feb e Lm (ca 0 tor for lo 0 tor for lo 0 mLm (V 0 gains ca 0 g require 0 zero if (	380.12         ement in         puirement         July and         Mar         alculated         0         poss hm         0         Vatts) = (         0         lculated         0         vatts) = (         0         lculated         0         lculated         0         lculated         0         lculated         0         ement fo         (104)m	228.24 kWh/m <sup>2</sup> August. Apr using 25 0 (100)m x 0 for appli 0 r month, 3 x (98	116.95 /year See Tal May 5°C inter 0 (101)m 0 (101)m 0 cable we 0 whole c m	0 ole 10b Jun nal temp 842.02 0.83 695.44 eather re 1102.28 <i>dwelling,</i>	0 Jul berature 662.87 0.88 581.74 egion, se 1056.45 continue	0 Tota Aug and exte 679.88 0.86 581.93 e Table 991.26 pus ( kM	0 I per year Sep ernal ten 0 10) 0 /h) = 0.0	229.2 (kWh/year Oct nperatur 0 0 0 24 x [(10	421.36 ) = Sum(9 ) e from T 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	8)15,912 = Dec able 10) 0 0 0 102)m ] 2	34.91	(100) (101) (102)
(98)m= Space 8c. S Calcu Heat (100)m= Utilisa (101)m= Usefu (102)m= Gains (103)m= Space	588 e heatin pace co llated fo Jan loss rate 0 ation fac 0 ul loss, h 0 s (solar s 0 e coolin 0 04)m to	453.7 g require oling req r June, Feb e Lm (ca 0 etor for lo 0 mLm (V 0 gains ca 0 g require	380.12 ement in quiremen July and Mar alculated 0 oss hm 0 Vatts) = ( 0 lculated 0 ement fo	228.24 kWh/m <sup>2</sup> August. Apr using 28 0 (100)m x 0 for appli 0 <i>r month,</i>	116.95 2/year See Tal May 5°C inter 0 (101)m 0 (101)m 0 cable we 0 whole c	0 ble 10b Jun nal temp 842.02 0.83 695.44 eather re 1102.28	0 Jul perature 662.87 0.88 581.74 egion, se 1056.45	0 Tota Aug and ext 679.88 0.86 581.93 e Table 991.26	0 Il per year Sep ernal ten 0 10) 0 (h) = 0.0	229.2 (kWh/year 0 0 0 24 x [(10 0	421.36 ) = Sum(9) ) = Sum(9) e from T 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	8)15,912 = Dec able 10) 0 0	34.91	(100) (101) (102) (103)
(98)m= Space 8c. S Calcu Heat (100)m= Utilisa (101)m= Usefu (102)m= Gains (103)m= <i>Spac</i> set (1 (104)m=	588 e heatin pace co lated fo Jan loss rate 0 ation fac 0 loss, h 0 s (solar g 0 loss (solar g 0 loss) b	453.7 g require oling red r June, C Feb e Lm (ca 0 tor for lo 0 mLm (V 0 gains ca 0 g require 2 zero if ( 0	380.12         ement in         puirement         July and         Mar         alculated         0         poss hm         0         Vatts) = (         0         lculated         0         vatts) = (         0         lculated         0         lculated         0         lculated         0         lculated         0         ement fo         (104)m	228.24 kWh/m <sup>2</sup> August. Apr using 25 0 (100)m x 0 for appli 0 r month, 3 x (98	116.95 /year See Tal May 5°C inter 0 (101)m 0 (101)m 0 cable we 0 whole c m	0 ole 10b Jun nal temp 842.02 0.83 695.44 eather re 1102.28 <i>dwelling,</i>	0 Jul berature 662.87 0.88 581.74 egion, se 1056.45 continue	0 Tota Aug and exte 679.88 0.86 581.93 e Table 991.26 pus ( kM	0 I per year Sep ernal ten 0 10) 0 10) 0 /h) = 0.0 Total	229.2 (kWh/year 0 0 24 x [(10 0 = Sum(	$\frac{421.36}{100} = \text{Sum}(9)$	8)15,912 = Dec able 10) 0 0 0 102)m ] 5 0 =	34.91 < (41)m 950.65	(100) (101) (102) (103)
(98)m= Space 8c. S Calcu Heat (100)m= Utilisa (101)m= Usefu (102)m= Gains (103)m= Space set (1 (104)m= Cooleo	588 e heatin pace co llated fo Jan loss rate 0 ation fac 0 ation fac 0 s (solar ( 0 s (solar ( 0 c cooline 0 d fraction	453.7 g require oling req r June, Feb E Lm (ca 0 ctor for lo 0 ctor for lo 0 mLm (V 0 gains ca 0 gains ca 0 g require 1 2 zero if ( 0	380.12         ement in         puirement         July and         Mar         alculated         0         poss hm         0         Vatts) = (         0         Iculated         0         ement fo         (104)m <	228.24 kWh/m <sup>2</sup> August. Apr using 25 0 0 (100)m x 0 (100)m x 0 for appli 0 r month, 3 x (98 0	116.95 /year See Tal May 5°C inter 0 (101)m 0 (101)m 0 cable we 0 whole c m	0 ole 10b Jun nal temp 842.02 0.83 695.44 eather re 1102.28 <i>dwelling,</i>	0 Jul berature 662.87 0.88 581.74 egion, se 1056.45 continue	0 Tota Aug and exte 679.88 0.86 581.93 e Table 991.26 pus ( kM	0 I per year Sep ernal ten 0 10) 0 10) 0 /h) = 0.0 Total	229.2 (kWh/year 0 0 0 24 x [(10 0	$\frac{421.36}{100} = \text{Sum}(9)$	8)15,912 = Dec able 10) 0 0 0 102)m ] 5 0 =	34.91 < (41)m	(100) (101) (102) (103)
(98)m= Space 8c. S Calcu Heat (100)m= Utilisa (101)m= Usefu (102)m= Gains (103)m= Spac set (1 (104)m= Cooleco Interm	588 e heatin pace co ilated fo Jan loss rate 0 ation fac 0 ation fac 0 ation fac 0 s (solar g 0 e cooling 04)m to 0 d fraction ittency fa	453.7 g require oling red r June, C Feb e Lm (ca 0 tor for lo 0 mLm (V 0 gains ca 0 g require 2 zero if ( 0 n actor (Ta	380.12ement inuirementJuly andJuly andMaralculated00vatts) = (00lculated0lculated00lculated0able 10b	228.24 kWh/m <sup>2</sup> August. Apr using 25 0 (100)m x 0 for appli 0 r month, 3 x (98 0	116.95 2/year See Tal May 5°C inter 0 (101)m 0 (101)m 0 cable we 0 whole c )m 0	0 ole 10b Jun nal temp 842.02 0.83 695.44 eather re 1102.28 <i>dwelling</i> , 292.92	0 Jul berature 662.87 0.88 581.74 29jon, se 1056.45 continuo 353.18	0 Tota Aug and extr 679.88 0.86 581.93 re Table 991.26 500s ( kM 304.54	0 I per year Sep ernal ten 0 10) 0 10) 0 /h) = 0.0 Total f C =	229.2           (kWh/year           0           0           0           0           24 x [(10           0           1 = Sum(           cooled a	$\frac{421.36}{100} = Sum(9)$ $\frac{100}{100} = Sum(9)$ $\frac{100}{100} = Sum(9)$ $\frac{100}{100} = Sum(9)$ $\frac{100}{100} = Sum(9)$	8)15,912 = Dec able 10) 0 0 0 102)m ] 2 0 = 4) =	34.91 < (41)m 950.65	(100) (101) (102) (103)
(98)m= Space 8c. S Calcu Heat (100)m= Utilisa (101)m= Usefu (102)m= Gains (103)m= Space set (1 (104)m= Cooleo	588 e heatin pace co ilated fo Jan loss rate 0 ation fac 0 ation fac 0 ation fac 0 s (solar g 0 e cooling 04)m to 0 d fraction ittency fa	453.7 g require oling req r June, Feb E Lm (ca 0 ctor for lo 0 ctor for lo 0 mLm (V 0 gains ca 0 gains ca 0 g require 1 2 zero if ( 0	380.12         ement in         puirement         July and         Mar         alculated         0         poss hm         0         Vatts) = (         0         Iculated         0         ement fo         (104)m <	228.24 kWh/m <sup>2</sup> August. Apr using 25 0 0 (100)m x 0 (100)m x 0 for appli 0 r month, 3 x (98 0	116.95 /year See Tal May 5°C inter 0 (101)m 0 (101)m 0 cable we 0 whole c m	0 ole 10b Jun nal temp 842.02 0.83 695.44 eather re 1102.28 <i>dwelling,</i>	0 Jul berature 662.87 0.88 581.74 egion, se 1056.45 continue	0 Tota Aug and exte 679.88 0.86 581.93 e Table 991.26 pus ( kM	0 l per year Sep ernal ten 0 10) 0 10) 0 /h) = 0.0 0 Total f C = 0	229.2           (kWh/year           0	$\frac{421.36}{1.04} = Sum(9)$	$B_{15,912} = 0$ $Dec$ $able 10)$ $0$ $0$ $0$ $102)m j = 0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$	34.91 < (41)m 950.65 1	(100) (101) (102) (103) (104) (105)
(98)m= Space 8c. S Calcu Heat (100)m= Utilisa (101)m= Usefu (102)m= Gains (103)m= <i>Spac</i> set (1 (104)m= Cooleco Interm (106)m=	588 e heatin pace co lated fo Jan loss rate 0 ation fac 0 loss, h 0 loss,	453.7 g require oling red r June, C Feb e Lm (ca 0 tor for lo 0 mLm (V 0 gains ca 0 g require 2 zero if ( 0 n actor (Ta 0	380.12ement inuirementJuly andJuly andMaralculated00vatts) = (00lculated0lculated00lculated0able 10b	228.24 kWh/m <sup>2</sup> August. Apr using 25 0 (100)m x 0 for appli 0 r month, 3 x (98 0	116.95 2/year See Tal May 5°C inter 0 (101)m 0 (101)m 0 cable we 0 whole c )m 0	0 ole 10b Jun nal temp 842.02 0.83 695.44 eather re 1102.28 <i>dwelling</i> , 292.92 0.25	0 Jul berature 662.87 0.88 581.74 egion, se 1056.45 continuo 353.18	0 Tota Aug and extr 679.88 0.86 581.93 re Table 991.26 500s ( kM 304.54	0 l per year Sep ernal ten 0 10) 0 10) 0 /h) = 0.0 0 Total f C = 0	229.2           (kWh/year           0           0           0           0           24 x [(10           0           1 = Sum(           cooled a	$\frac{421.36}{1.04} = Sum(9)$	8)15,912 = Dec able 10) 0 0 0 102)m ] 2 0 = 4) =	34.91 < (41)m 950.65	(100) (101) (102) (103) (104) (105) (106)

Space cooling requirement for month = $(104)m \times (105) \times (106)m$															
(107)m=	(107)m = 0 0 0 0 0 73.23 88.3 76.14 0 0 0 0 Total = Sum(107) =														
-		23	37.66	(107)											
Space	Space cooling requirement in kWh/m <sup>2</sup> /year $(107) \div (4) =$														
8f. Fab	ric Enei	gy Effici	iency (ca	alculatec	l only un	der spec	cial cond	litions, se	ee sectio	on 11)					
Fabric	Energy	/ Efficier	псу			(99) -	+ (108) =	=	3	7.65	(109)				

## SAP Input

Property Details: Pl	ot 19												
Address: Located in: Region: UPRN: Date of assessm Date of certifica Assessment type Transaction type Tenure type: Related party di Thermal Mass Pa Water use <= 1. PCDF Version:	te: e: e: sclosure: arameter:	08 July 28 Oct New d New d Unkno No rela Indica	es valley / 2020 ober 2020 welling design sta welling	ge									
Property description	n:												
Dwelling type: Detachment:		Flat											
Year Completed:		2020											
Floor Location:		Floor	area:										
Floor 0		86.6 n	2	S	torey height 2.5 m	:							
Living area:			<sup>1-</sup> m <sup>2</sup> (fraction 0.34	4)	2.5 11								
Front of dwelling f	aces:	North											
Opening types:			Type: Glazing: Argon: Frame:										
Name:	Source:		Type: Glazing: Argon: Solid										
NE SE	Manufacturer Manufacturer		olid /indows	Yes									
SW	Manufacturer	· V	/indows	Yes									
NW	Manufacturer	· V	/indows	Yes	es								
Name:	Gap:		Frame Facto	or: g-value:	U-value:	Area:	No. c	of Openings:					
NE	mm		0	0	1.4	2	1						
SE SW	16mm o 16mm o		0.7 0.7	0.63 0.63	1.4 1.4	6.097 6.075	1 1						
NW	16mm o		0.7	0.63	1.4	4.579	1						
Name:	Type-Nam		ocation:	Orient:		Width:	Heig	ht:					
NE SE			orridor Wall xternal Wall	North East South East		0 0	0 0						
SW			xternal Wall	South West		0	0						
NW			External Wall North West 0 0										
Overshading:		Averaç	je or unknown										
Opaque Elements:													
Type: External Elements	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain	wall:	Карра:					
External Wall	78.751	16.75	62	0.15 0		False		N/A					
Corridor Wall	14.374	2	12.37	0.15	0.4	False		N/A					
Stairwell Wall	12.562	0	12.56	0.15	0.9	False		N/A					
Exposed Floor	9.39			0.12				N/A					
Internal Elements													
Party Elements													

Thermal bridges:

## **SAP Input**

Thermal bridges:			I-values)	Y-Value = 0.1105
	<b>Length</b> 8.395	<b>Psi-value</b> 0.294	E2	Other lintels (including other steel lintels)
	31.2	0.274	E4	Jamb
	72.817	0.067	E7	Party floor between dwellings (in blocks of flats)
[Approved]	5.45	0.09	E16	Corner (normal)
	2.725	-0.072	E17	Corner (inverted internal area greater than external area)
	4.754	0.291	E20	Exposed floor (normal)
	3.951	0.16	E21	Exposed floor (inverted)
	5.45	0.055	E18	Party wall between dwellings
	5.45	0.109 0	E25 P3	Staggered party wall between dwellings Intermediate floor between dwellings (in blocks of flats)
	16.338 3.951	0 0.16	РЗ Р7	Exposed floor (normal)
Ventilation:				
Pressure test:	Yes (As desi	aned)		
Ventilation:		th heat recover	·v	
		vet rooms: Kitc	2	
	Ductwork: I	nsulation, rigid		
	Approved In	stallation Sche	me: True	
Number of chimneys:	0			
Number of open flues:	0			
Number of fans:	0			
Number of passive stacks:	0			
Number of sides sheltered:	1 3			
Pressure test:	3			
Main heating system:				
Main heating system:		heating scheme		
		: Community b		t fraction 1 officiency 04
			-	It fraction 1, efficiency 94 emp, variable flow
		ing pump : 201		
		temperature: L		1
	Boiler interlo	•		
Main heating Control:				
Main heating Control:	Charging sys	stem linked to u	use of co	mmunity heating, programmer and at least two room
	thermostats			5 0.1 0
	Control code	e: 2312		
Secondary heating system:				
Secondary heating system:	None			
Water heating:				
Water heating:	From main h	neating system		
	Water code:			
	Fuel :mains	0		
	No hot wate	•		
	Solar panel:	False		
Others:				
Electricity tariff:	Standard Ta	riff		
In Smoke Control Area:	Unknown			
Conservatory:	No conserva	itory		
Low energy lights:	100%	an / suburban		
Terrain type:	Low rise urb English	an / suburban		
EPC language: Wind turbine:	No			
Photovoltaics:	<u>Photovoltai</u>	ic 1		
	THOLOVUILD			

## **SAP Input**

Installed Peak power: 1.06 Tilt of collector: 30° Overshading: None or very little Collector Orientation: South West No

Assess Zero Carbon Home:

User Details:	
	0001082 on: 1.0.5.9
Property Address: Plot 19	
Address :	
1. Overall dwelling dimensions:	
Area(m²)         Av. Height(m)           Ground floor         86.6         (1a) x         2.5         (2a) =	Volume(m <sup>3</sup> ) 216.5 (3a)
Total floor area TFA = $(1a)+(1b)+(1c)+(1d)+(1e)+(1n)$ (4)	
Dwelling volume $(3a)+(3b)+(3c)+(3d)+(3e)+(3n) =$	216.5 (5)
2. Ventilation rate:	
main secondary other total heating heating	m <sup>3</sup> per hour
Number of chimneys $0 + 0 + 0 = 0 \times 40 =$	0 (6a)
Number of open flues $0 + 0 + 0 = 0 \times 20 =$	0 (6b)
Number of intermittent fans 3 x 10 =	30 (7a)
Number of passive vents 0 x 10 =	0 (7b)
Number of flueless gas fires 0 × 40 =	0 (7c)
Air c	hanges per hour
Infiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7b)+(7c) = 30$ $\div$ (5) =	0.14 (8)
If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)	0.14
Number of storeys in the dwelling (ns)	0 (9)
Additional infiltration [(9)-1]x0.1 =	0 (10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35	0 (11)
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0	0 (12)
If no draught lobby, enter 0.05, else enter 0	0 (13)
Percentage of windows and doors draught stripped	0 (14)
Window infiltration         0.25 - [0.2 x (14) ÷ 100] =	0 (15)
Infiltration rate $(8) + (10) + (11) + (12) + (13) + (15) =$	0 (16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area	5 (17)
If based on air permeability value, then $(18) = [(17) \div 20]+(8)$ , otherwise $(18) = (16)$	0.39 (18)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used	
Number of sides shelteredShelter factor(20) = 1 - [0.075 x (19)] =	1 (19) 0.92 (20)
Infiltration rate incorporating shelter factor $(21) = (18) \times (20) =$	0.36 (21)
Infiltration rate modified for monthly wind speed	0.00
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	]
Monthly average wind speed from Table 7	
(22)m= 5.1 5 4.9 4.4 4.3 3.8 3.8 3.7 4 4.3 4.5 4.7	]
Wind Factor (22a)m = (22)m $\div$ 4	

$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$	Adjusted	l infiltra	ation rate	e (allowi	ng for sh	elter an	d wind s	peed) =	(21a) x	(22a)m	-	-			
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $					-				0.33	0.36	0.39	0.4	0.42		
If exhaust ein heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) (23a) (23b) (23a) (23b) (23a) (23b) (23a) (23b) (23a) (23b) (2				-	rate for t	he appli	cable ca	se						0	(23a)
If balanced with heat recovery, efficiency in % allowing for in-use factor (from Table 4h) = (24gm 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0					endix N. (2	3b) = (23a	i) x Fmv (e	equation (N	(15)) . othei	wise (23b	) = (23a)				
a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 - (23c) + 100) (24a)m = $0$ 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0											, ( ,				
$ \begin{array}{c c} (24a)m_{1} \hline 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0$						Ū		``			2h)m + (	23h) x [′	1 – (23c)	Ţ	(200)
b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b) (24b)m 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	· –		1						<i>,</i> ,	, <u>,</u>	<u>,                                     </u>	1 -	<u> </u>	. 100]	(24a)
$ \begin{array}{c cl} (24b) \hline 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0$		alance	d mecha	anical ve	ntilation	without	heat rec	coverv (N	L /\V) (24b	m = (22)	L 2b)m + ()	L 23b)			
c) If whole house extract ventilation or positive input ventilation from outside if (22b)m $(24c)m = 0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ 	í –							, <u>,</u>	<i>,</i> ,	, ,	r í	ŕ	0		(24b)
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $		hole ho	ouse ext	ract ven	tilation c	or positiv	re input v	ventilatio	n from c	outside					
a) If natural venitiation or whole house positive input venitiation from loft if (22b)m = 1, then (24c)m = (22b)m otherwise (24c)m = 0.5 + [(22b)m <sup>2</sup> × 0.5]       (24d)m       0.61       0.6       0.68       0.57       0.56       0.56       0.57       0.58       0.59       (24d)m         (25)m       0.61       0.6       0.68       0.57       0.56       0.56       0.57       0.58       0.59       (24d)m         (25)m       0.61       0.6       0.68       0.57       0.56       0.57       0.58       0.59       (25)         (25)m       0.61       0.6       0.68       0.67       0.56       0.57       0.58       0.59       (25)         (25)m       0.61       0.6       0.68       0.67       0.56       0.56       0.57       0.58       0.59       (25)         (25)m       0.61       0.6       0.68       0.67       0.75       0.58       0.59       (25)         (26)       0.77       x1/11/(1.4)+0.04]       8.06       (27)       (27)       (26)       (27)       (27)       (26)       (27)       (28)       (28)       (28)       (28)       (28)       (28)       (28)       (28)       (29)       (29)       (29)       (29)       (29)	,					•	•				.5 × (23b	))			
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24c)
International construction         International construction         International construction         International construction           Effective air change rate - enter (24a) or (24b) or (24c) or (24c) or (24c) in box (25)         (25)         (25)           (25)m=         0.61         0.6         0.58         0.57         0.56         0.56         0.57         0.58         0.59         (25)           (25)m=         0.61         0.6         0.58         0.57         0.58         0.59         (25)           (25)m=         0.61         0.6         0.58         0.57         0.58         0.59         (25)           (26)m=         Gross         0.9 enings         Net Area         U-value         A X U         k-value         A X k           Windows Type 1         6.097         x1/1/(1.4) + 0.04]         8.08         (27)           Windows Type 3         0.13         1.2207         (28)         (29)           Walls Type 1         78.75         16.75         62         x         0.18         1.2207         (29)           Walls Type 2         11.37         2         12.56         0         12.56         x         0.18         2.2.26         (29)           Valla rea of elements, m <sup>2</sup> 115.	,						•				0.5]				
	(24d)m=	0.61	0.6	0.6	0.58	0.57	0.56	0.56	0.56	0.56	0.57	0.58	0.59		(24d)
3. Heat losses and heat loss parameter:         ELEMENT       Gross area (m²)       Openings Met Area A, m²       U-value W/m2K       A X U (W/K)       k-value A X k KJ/K         Doors       2       x       1       =       2       (26)         Windows Type 1       6.097       x1{11(1.4) + 0.04} =       8.08       (27)         Windows Type 2       6.075       x1{11(1.4) + 0.04} =       8.05       (27)         Windows Type 3       4.579       x1{11(1.4) + 0.04} =       6.07       (27)         Floor       9.39       x       0.13       =       1.2207       (28)         Walls Type1       78.75       16.75       62       x       0.18       =       11.6       (29)         Walls Type2       14.37       2       12.56       x       0.18       =       2.26       (29)         Walls Type3       12.56       0       12.56       x       0.18       =       2.26       (29)         Vallar type3       12.56       0       115.03       ''       (11)       (20)       (21)       (31)       ''         'for windows and roof windows, use effective window U-value calculated using formula 1/{(1/U-value)+0.04] as given in paragraph 3.2       ''       ''	Effecti	ve air o	change	rate - er	nter (24a	) or (24b	o) or (24	c) or (24	d) in box	(25)					
ELEMENT         Gross area (m <sup>2</sup> )         Openings m <sup>2</sup> Net Area A, m <sup>2</sup> U-value W/m2K         A X U (W/K)         k-value kJ/m <sup>2</sup> -K         A X k kJ/K           Doors         2         x         1         =         2         (26)           Windows Type 1         6.097         x1/1/(1.4)+0.04]         8.08         (27)           Windows Type 2         6.075         x1/1/(1.4)+0.04]         8.05         (27)           Windows Type 3         4.579         x1/1/(1.4)+0.04]         6.07         (27)           Floor         9.39         x         0.13         =         1.2207         (28)           Walls Type1         78.75         16.75         62         x         0.18         =         1.2207         (29)           Walls Type3         12.56         0         12.56         0.18         =         2.23         (29)           Valla Type3         12.56         0         12.56         0.18         =         2.26         (31)           * for windows and roof windows, use effective window U-value calculated using formula 1/(1/U-value)+0.04] as given in paragraph 3.2         ***         **         *         *         115.08         (31)           * for windows and roof windows, use effective window U-value	(25)m=	0.61	0.6	0.6	0.58	0.57	0.56	0.56	0.56	0.56	0.57	0.58	0.59		(25)
ELEMENT         Gross area (m <sup>2</sup> )         Openings m <sup>2</sup> Net Area A, m <sup>2</sup> U-value W/m2K         A X U (W/K)         k-value kJ/m <sup>2</sup> -K         A X k kJ/K           Doors         2         x         1         =         2         (26)           Windows Type 1         6.097         x1/1/(1.4)+0.04]         8.08         (27)           Windows Type 2         6.075         x1/1/(1.4)+0.04]         8.05         (27)           Windows Type 3         4.579         x1/1/(1.4)+0.04]         6.07         (27)           Floor         9.39         x         0.13         =         1.2207         (28)           Walls Type1         78.75         16.75         62         x         0.18         =         1.2207         (29)           Walls Type3         12.56         0         12.56         0.18         =         2.23         (29)           Valla Type3         12.56         0         12.56         0.18         =         2.26         (31)           * for windows and roof windows, use effective window U-value calculated using formula 1/(1/U-value)+0.04] as given in paragraph 3.2         ***         **         *         *         115.08         (31)           * for windows and roof windows, use effective window U-value	3 Heat	losses	and he	at loss r	haramete	۵r.					•	•	•		
Doors       2       x       1       =       2       (2)         Windows Type 1       6.097       x1/(1/(1.4) + 0.04) =       8.08       (27)         Windows Type 2       6.075       x1/(1/(1.4) + 0.04) =       8.05       (27)         Windows Type 3       4.579       x1/(1/(1.4) + 0.04) =       6.07       (27)         Floor       9.39       x       0.13       =       1.207       (28)         Walls Type 1       78.75       16.75       6.2       x       0.18       =       11.16       (29)         Walls Type 2       14.37       2       12.37       x       0.18       =       2.26       (29)         Walls Type 3       12.56       0       12.56       x       0.18       =       2.26       (29)         Walls Type 3       12.56       0       12.56       x       0.18       =       2.26       (29)         Valla Type 3       12.56       0       12.50       (26)(30) + (32) =       (31)       *       (31)       *         * for windows and rod windows, use effective window U-value calculated using formula 1/(1/U-value)+0.04] as given in paragraph 3.2       (33)       *       (31)       *       *       (31) <t< td=""><td></td><td></td><td>Gros</td><td>S</td><td>Openin</td><td>gs</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></t<>			Gros	S	Openin	gs									
Windows Type 1       6.097 $x1(11(1.4) + 0.04] =$ 8.08       (27)         Windows Type 2       6.075 $x1(11(1.4) + 0.04] =$ 8.05       (27)         Windows Type 3       4.579 $x1(11(1.4) + 0.04] =$ 6.07       (27)         Floor       9.39 $x 0.13 =$ 1.207       (28)         Walls Type 1       78.75       16.75       62 $x 0.18 =$ 11.16       (29)         Walls Type 2       14.37       2       12.37 $x 0.18 =$ 2.23       (29)         Walls Type 3       12.56       0       12.56 $x 0.18 =$ 2.26       (29)         Valla Type 3       12.56       0       12.56 $x 0.18 =$ 2.26       (29)         Valla Type 3       12.56       0       12.56 $x 0.18 =$ 2.26       (29)         Valla Type 3       12.56       0       12.56 $x 0.18 =$ 2.26       (29)         Valla Type 3       12.56       0       12.56 $x 0.18 =$ 2.26       (29)         Valla Type 3       12.56 $x 0.18 =$ 2.26       (29)       (31)       *         * include the areas on both sides of internal walks and partitions	Doors		urcu	(111)										<b>`</b>	
Windows Type 2       6.075       x1/(1/(1.4) + 0.04) =       8.05       (27)         Windows Type 3       4.579       x1/(1/(1.4) + 0.04) =       6.07       (27)         Floor       9.39       x       0.13       =       1.2207       (28)         Walls Type 1       78.75       16.75       62       x       0.18       =       11.16       (29)         Walls Type 2       14.37       2       12.37       x       0.18       =       2.23       (29)         Walls Type 3       12.56       0       12.56       x       0.18       =       2.26       (29)         Total area of elements, m <sup>2</sup> 115.08       (31)       *       (31)       *       (31)         * include the areas on both sides of internal walts and partitions         Fabric heat loss, W/K = S (A x U)       (26)(30) + (32) =       (41.08       (33)         Heat capacity Cm = S(A x k)       (26)(30) + (32) =       (192)(32e) =       (1921.35       (34)         Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m <sup>2</sup> K       Indicative Value: Medium       250       (35)         Cord sign assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f <td></td> <td>s Type</td> <td>1</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td> !</td> <td></td> <td></td> <td></td> <td></td> <td></td>		s Type	1							!					
Windows Type 3       4.579       x1/[1/(1.4) + 0.04] =       6.07       (27)         Floor       9.39       x       0.13       =       1.2207       (28)         Walls Type 1       78.75       16.75       62       x       0.18       =       11.16       (29)         Walls Type 2       14.37       2       12.37       x       0.18       =       2.23       (29)         Walls Type 3       12.56       0       12.56       x       0.18       =       2.26       (29)         Total area of elements, m <sup>2</sup> 115.08       (31)       *       (31)       *       *       (31)         * for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2       *       *       (31)         * for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2       *       *       (33)         * include the areas on both sides of internal walls and partitions       (26)(30) + (32) =       41.08       (33)         Fabric heat loss, W/K = S (A x U)       (26)(30) + (32) =       41.08       (34)         Thermal mass parameter (TMP = Cm + TFA) in kJ/m <sup>2</sup> K       Indicative value: Medium       250       (35)       Fo								<b>_</b>							
Floor       9.39       x       0.13       =       1.2207       (28)         Walls Type1       78.75       16.75       62       x       0.18       =       11.16       (29)         Walls Type2       14.37       2       12.37       x       0.18       =       2.23       (29)         Walls Type3       12.56       0       12.56       x       0.18       =       2.26       (29)         Total area of elements, m <sup>2</sup> 115.08       (31)       *       (31)       *       (31)         * for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2         **** include the areas on both sides of internal walls and partitions         For the at loss, W/K = S (A x U)       (26)(30) + (32) =       41.08       (33)         Heat capacity Cm = S(A x k)       ((28)(30) + (32) + (32a)(32e) =       1921.35       (34)         Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m <sup>2</sup> K       Indicative values of TMP in Table 1f       (35)         For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f       (36)         if details of thermal bridging are not known (36) = 0.05 x (31)       11.39       (36)       (33) + (36) =															
Walls Type1       78.75       16.75       62       x       0.18       =       11.16       (29)         Walls Type2       14.37       2       12.37       x       0.18       =       2.23       (29)         Walls Type3       12.56       0       12.56 $x$ 0.18       =       2.26       (29)         Total area of elements, m2       115.08       (31)       *       (31)       *       (31)         * for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2       **       (31)         * include the areas on both sides of internal walls and partitions       Fabric heat loss, W/K = S (A x U)       (26)(30) + (32) =       41.08       (33)         Heat capacity Cm = S(A x k)       ((28)(30) + (32) + (32a)(32e) =       1921.35       (34)         Thermal mass parameter (TMP = Cm + TFA) in kJ/m²K       Indicative Value: Medium       250       (35)         For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f       (36)         can be used instead of a detailed calculation.       11.39       (36)       (33) + (36) =       52.47       (37)         Ventilation heat loss calculated monthly       (38) m = 0.33 × (25)m × (5)       (38) m = 0.3		siype	5							¦					`
Walls Type214.37212.37x0.18=2.23(29)Walls Type312.56012.56x0.18=2.26(29)Total area of elements, m2115.08(31)* for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2(31)* include the areas on both sides of internal walls and partitions(26)(30) + (32) =41.08(33)Fabric heat loss, W/K = S (A x U)(26)(30) + (32) =41.08(33)Heat capacity Cm = S(A x k)((28)(30) + (32) + (32a)(32e) =1921.35(34)Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m2KIndicative Value: Medium250(35)For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f(36)can be used instead of a detailed calculation.11.39(36)Thermal bridging are not known (36) = $0.05 \times (31)$ (33) + (36) =52.47Total fabric heat loss(31) + (38)m = $0.33 \times (25)m \times (5)$ (38)m = $0.33 \times (25)m \times (5)$ (38)m= $\overline{32.22}$ 42.9342.6541.3141.0639.8939.6740.3441.0641.5642.09(38)Heat transfer coefficient, W/K(39)m = $(37) + (38)m$ (39)m = $95.7$ $95.4$ $95.12$ $93.78$ $92.36$ $92.14$ $92.81$ $93.53$ $94.03$ $94.56$								×		= 1					
Walls Type312.56012.56x0.18=2.26(29)Total area of elements, m2115.08(31)* for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2(31)** include the areas on both sides of internal walls and partitions(26)(30) + (32) =41.08Fabric heat loss, W/K = S (A x U)(26)(30) + (32) =41.08Heat capacity Cm = S(A x k)(128)(30) + (32) + (328)(32e) =1921.35Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²KIndicative Value: Medium250For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.11.39(36)Thermal bridges : S (L x Y) calculated using Appendix K11.39(36)if details of thermal bridging are not known (36) = 0.05 x (31)(33) + (36) =52.47(37)Ventilation heat loss(33) + (36) =52.47(37)(38)m= $43.22$ $42.93$ $42.65$ $41.31$ $41.06$ $39.89$ $39.67$ $40.34$ $41.06$ $41.56$ $42.09$ (38)Heat transfer coefficient, W/K(39)m = (37) + (38)m(39)m =95.7 $95.4$ $95.12$ $93.78$ $92.36$ $92.14$ $92.81$ $93.53$ $94.03$ $94.56$	-		78.7	5	16.75	5			0.18	=	11.16			$\dashv$	
Total area of elements, m2115.08(31)* for windows and roof windows, use effective window U-value calculated using formula $1/[(1/U-value)+0.04]$ as given in paragraph 3.2(31)** include the areas on both sides of internal walls and partitionsFabric heat loss, W/K = S (A x U)(26)(30) + (32) =41.08Fabric heat loss, W/K = S (A x L)(26)(30) + (32) =41.08(33)Heat capacity Cm = S(A x k)((28)(30) + (32) + (32a)(32e) =1921.35Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²KIndicative Value: Medium250For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.11.39Thermal bridges : S (L x Y) calculated using Appendix K11.39(36)if details of thermal bridging are not known (36) = 0.05 x (31)(33) + (36) =52.47Total fabric heat loss(33) + (36) =52.47(37)Ventilation heat loss calculated monthly(38) m = 0.33 x (25) m x (5)(38)(38)m= $43.22$ $42.93$ $42.65$ $41.31$ $41.06$ $39.89$ $39.67$ $40.34$ $41.06$ $41.56$ $42.09$ (38)Heat transfer coefficient, W/K(39)m = (37) + (38)m(39)m = (37) + (38)m(39)m = (37) + (38)m(39)m = (37) + (38)m	•	•			2		12.37	′ X		=	2.23				
* for windows and roof windows, use effective window U-value calculated using formula $1/[(1/U-value)+0.04]$ as given in paragraph 3.2 ** include the areas on both sides of internal walls and partitions Fabric heat loss, W/K = S (A × U) (26)(30) + (32) = 41.08 (33) Heat capacity Cm = S(A × k) ((28)(30) + (32) + (32a)(32e) = 1921.35 (34) Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m <sup>2</sup> K Indicative Value: Medium 250 (35) For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation. Thermal bridges : S (L × Y) calculated using Appendix K 11.39 (36) if details of thermal bridging are not known (36) = 0.05 × (31) Total fabric heat loss calculated monthly (38)m = 0.33 × (25)m × (5) Ventilation heat loss calculated monthly (38)m = 0.33 × (25)m × (5) (38)m = $43.22$ 42.93 42.65 41.31 41.06 39.89 39.89 39.67 40.34 41.06 41.56 42.09 (38) Heat transfer coefficient, W/K (39)m = (37) + (38)m (39)m = $95.7$ 95.4 95.12 93.78 93.53 92.36 92.36 92.14 92.81 93.53 94.03 94.56		•			0		12.56	) X	0.18	=	2.26				(29)
** include the areas on both sides of internal walls and partitions Fabric heat loss, W/K = S (A x U) (26)(30) + (32) = 41.08 (33) Heat capacity Cm = S(A x k) ((28)(30) + (32) + (32a)(32e) = 1921.35 (34) Thermal mass parameter (TMP = Cm $\div$ TFA) in kJ/m <sup>2</sup> K Indicative Value: Medium 250 (35) For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation. Thermal bridges : S (L x Y) calculated using Appendix K 11.39 (36) if details of thermal bridging are not known (36) = 0.05 x (31) Total fabric heat loss $(33) + (36) = 52.47$ (37) Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5) (38)m = 43.22 42.93 42.65 41.31 41.06 39.89 39.89 39.67 40.34 41.06 41.56 42.09 (38) Heat transfer coefficient, W/K (39)m = (37) + (38)m (39)m = 95.7 95.4 95.12 93.78 93.53 92.36 92.36 92.14 92.81 93.53 94.03 94.56															(31)
Heat capacity Cm = S(A x k) Heat capacity Cm = S(A x k) Thermal mass parameter (TMP = Cm $\div$ TFA) in kJ/m <sup>2</sup> K Indicative Value: Medium 250 (35) For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation. Thermal bridges : S (L x Y) calculated using Appendix K if details of thermal bridging are not known (36) = 0.05 x (31) Total fabric heat loss (33) + (36) = (38)m = $0.33 \times (25)m \times (5)$ Ventilation heat loss calculated monthly (38)m = $43.22$ 42.93 42.65 41.31 41.06 39.89 39.89 39.67 40.34 41.06 41.56 42.09 Heat transfer coefficient, W/K (39)m = $95.7$ $95.4$ $95.12$ $93.78$ $93.53$ $92.36$ $92.36$ $92.14$ $92.81$ $93.53$ $94.03$ $94.56$								ated using	formula 1,	/[(1/U-valı	ιe)+0.04] ε	as given in	paragraph	1 3.2	
Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²KIndicative Value: Medium250(35)For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.Thermal bridges : S (L x Y) calculated using Appendix K11.39(36)if details of thermal bridging are not known (36) = 0.05 x (31)Total fabric heat loss(33) + (36) =52.47(37)Ventilation heat loss calculated monthly(38)m = 0.33 × (25)m × (5)Image: Same transfer coefficient, W/K(39.89)39.8939.6740.3441.0641.5642.09(38)Heat transfer coefficient, W/K(39)m = (37) + (38)m(39)m = 95.795.495.1293.7893.5392.3692.1492.8193.5394.0394.56	Fabric he	eat los	s, W/K =	= S (A x	U)				(26)(30)	+ (32) =				41.08	(33)
For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.Thermal bridges : S (L x Y) calculated using Appendix K11.39(36)if details of thermal bridging are not known (36) = $0.05 \times (31)$ Total fabric heat loss(33) + (36) =(33) + (36) =(33) + (36) =(32) + (32)Ventilation heat loss calculated monthly(38)m = $0.33 \times (25)m \times (5)$ (38)m = $0.33 \times (25)m \times (5)$ (39)m = $(37) + (38)m$ (39)m = $(37) + (38)m$ (39)m = $95.7  95.4  95.12  93.78  93.53  92.36  92.36  92.14  92.81  93.53  94.03  94.56$	•	•								((28).	(30) + (32	2) + (32a).	(32e) =	1921.35	(34)
can be used instead of a detailed calculation.         Thermal bridges : S (L x Y) calculated using Appendix K         11.39         (36)         (33) + (36) =         (33) + (36) =         (33) + (36) =         (33) + (36) =         (37)         (38)m = 0.33 × (25)m × (5)         Ventilation heat loss calculated monthly         (38)m = 0.33 × (25)m × (5)         (38)m = (37) + (38)m         (39)m = (37) + (38)m         (39)m = (37) + (38)m         (39)m = 95.7       95.4       95.12       93.78       92.36       92.14       92.81       93.53       94	Thermal	mass	parame	ter (TMF	P = Cm ÷	· TFA) in	∩ kJ/m²K			Indica	tive Value	: Medium		250	(35)
if details of thermal bridging are not known (36) = $0.05 \times (31)$ (33) + (36) =         (33) + (36) =         (33) + (36) =         (33) + (36) =         (33) + (36) =         (33) + (36) =         (38)m = $0.33 \times (25)m \times (5)$ (38)m = $0.33 \times (25)m \times (5)$ (38)m = $0.33 \times (25)m \times (5)$ (38)m = $43.22 \times 42.93 \times 42.65 \times 41.31 \times 41.06 \times 39.89 \times 39.89 \times 39.89 \times 39.67 \times 40.34 \times 41.06 \times 41.56 \times 42.09$ (38)         (38)m = $(37) + (38)m$ (39)m = $(37) + (38)m$ (39)m = $95.7 \times 95.4 \times 95.12 \times 93.78 \times 93.53 \times 92.36 \times 92.36 \times 92.14 \times 92.81 \times 93.53 \times 94.03 \times 94.56$	-					constructi	ion are not	t known pro	ecisely the	indicative	e values of	TMP in Ta	able 1f		
(33) + (36) =       (33) + (36) =       (37)         Ventilation heat loss calculated monthly       (38)m = $0.33 \times (25)m \times (5)$ Jan       Feb       Mar       Apr       May       Jun       Jul       Aug       Sep       Oct       Nov       Dec       (38)         (38)m=       43.22       42.93       42.65       41.31       41.06       39.89       39.67       40.34       41.06       41.56       42.09       (38)         Heat transfer coefficient, W/K       (39)m = $(37) + (38)m$ (39)m = $95.7$ 95.4       93.53       92.36       92.14       92.81       93.53       94.03       94.56	Thermal	bridge	s : S (L	x Y) cal	culated u	using Ap	pendix ł	<						11.39	(36)
Ventilation heat loss calculated monthly       (38)m = $0.33 \times (25)m \times (5)$ Jan       Feb       Mar       Apr       May       Jun       Jul       Aug       Sep       Oct       Nov       Dec         (38)m =       43.22       42.93       42.65       41.31       41.06       39.89       39.67       40.34       41.06       41.56       42.09       (38)          (39)m = $(37) + (38)m$ 95.7       95.12       93.78       92.36       92.14       92.81       93.53       94.03       94.56				are not kn	own (36) =	<i>0.05 х (</i> 3	1)			(22)	(00)				
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $				loulotod	lmonthl							'05)m v (5)		52.47	(37)
(38)m=       43.22       42.93       42.65       41.31       41.06       39.89       39.67       40.34       41.06       41.56       42.09       (38)         Heat transfer coefficient, W/K       (39)m = (37) + (38)m         (39)m = 95.7       95.4       95.12       93.78       93.53       92.36       92.14       92.81       93.53       94.03       94.56							lun	11	٨٠٠٩	. ,			_		
Heat transfer coefficient, W/K $(39)m = (37) + (38)m$ $(39)m = 95.7$ $95.4$ $95.12$ $93.78$ $93.53$ $92.36$ $92.14$ $92.81$ $93.53$ $94.03$ $94.56$	(38)m=									-					(38)
(39)m= 95.7 95.4 95.12 93.78 93.53 92.36 92.36 92.14 92.81 93.53 94.03 94.56	`´						00.00		00.07				.2.00	l	(30)
					03 70	03 53	02.35	02.35	92 14		r		91 56		
									52.14					93.7 <b>8</b> ~~	( <del>3,</del>

Heat lo	oss para	meter (H	HLP), W	/m²K					(40)m	= (39)m ÷	- (4)			
(40)m=	1.11	1.1	1.1	1.08	1.08	1.07	1.07	1.06	1.07	1.08	1.09	1.09		
Numbe	er of day	/s in mo	nth (Tab	le 1a)			•	•		Average =	Sum(40) <sub>1</sub> .	12 /12=	1.08	(40)
T UNITED	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
												_		
4. Wa	ater hea	ting ene	rgy requ	irement:								kWh/ye	ear:	
		upancy, 9 N = 1		(1 - exp		349 x (TF	-13 9	)2)] + 0.(	)013 x (	TFA -13		58		(42)
	A £ 13.			i ovb	( 0.0000	/ <b>0</b> / (11		/_/]			,			
Reduce	the annua	al average	hot water		5% if the a	welling is	designed	(25 x N) to achieve		se target o		.39		(43)
notmore				1	· · · · ·	1	, T	Aug	Son	Oct	Nov	Dee		
Hot wate	Jan er usage i	Feb n litres per	Mar r day for ea	Apr ach month	May Vd,m = fa	Jun	Jul Table 1c x	Aug (43)	Sep	Oct	Nov	Dec		
(44)m=	104.92	101.11	97.29	93.48	89.66	85.85	85.85	89.66	93.48	97.29	101.11	104.92		
( ,											m(44) <sub>112</sub> =		1144.64	(44)
Energy o	content of	hot water	used - ca	lculated m	onthly = 4.	190 x Vd,r	m x nm x L	OTm / 3600	) kWh/mor	oth (see Ta	ables 1b, 1	c, 1d)		
(45)m=	155.6	136.09	140.43	122.43	117.48	101.37	93.94	107.79	109.08	127.12	138.77	150.69		
lf instan	taneous v	vater heati	ng at poin	t of use (no	o hot water	r storage),	enter 0 in	boxes (46		Total = Su	m(45) <sub>112</sub> =		1500.8	(45)
(46)m=	0	0	0	0	0	0	0	0	0	0	0	0		(46)
· · ·	storage	-	L ů	L °	Ů	Ů		L °	Ů	Ů	Ů	Ů		( - )
Storag	e volum	e (litres)	) includir	ng any se	olar or W	/WHRS	storage	within sa	ame ves	sel		150		(47)
If com	munity h	neating a	and no ta	ank in dw	velling, e	nter 110	) litres in	ı (47)						
			hot wate	er (this ir	ncludes i	nstantar	neous co	ombi boil	ers) ente	er '0' in (	47)			
	storage		oclarad	oss facto	or ie kno	wp (k\\/k	a/dav/):							(40)
		actor fro					i/uay).					0		(48)
				, kWh/ye	aar			(48) x (49)	) –			0		(49)
0,			•	cylinder		or is not	known:	(40) X (40)	/ –			0		(50)
				rom Tabl								0		(51)
	•	heating s		on 4.3										
		from Ta actor fro		. 2h								0		(52)
								(47) × (54)	V (EQ) v (	50)		0		(53)
•••		m water (54) in (5	-	e, kWh/ye	ear			(47) x (51)	) X (52) X (	53) =		0 0		(54) (55)
	. ,	. , .		for each	month			((56)m = (	55) x (41)	m		0		(00)
						0	0		0	0	0	0		(56)
(56)m= If cylinde	-	-	-	-	-			60), else (5	-	-		-	ix H	(00)
(57)m=	0	0	0	0	0	0	0	0	0	0	0	0		(57)
Primar	y circuit	loss (ar	nnual) fro	om Table	e 3							0		(58)
	•	•	,			59)m = (	(58) ÷ 36	65 × (41)	m					
•	dified by	factor f	rom Tab	le H5 if t	here is s	solar wat	ter heati	ng and a	cylinde	r thermo	stat)			
(59)m=	0	0	0	0	0	0	0	0	0	0	0	0		(59)

Combi	combi loss calculated for each month (61)m = (60) $\div$ 365 x (41)m																	
(61)m=	0	0	0		0	0		0	0	0		0	0	0	0			(61)
Total h	eat req	uired for	water	he	ating ca	alculated	l fo	r eacł	n month	(62)m	n = 0	).85 × (	(45)m -	- (46)m +	(57)m	) + (	(59)m + (61)m	
(62)m=	132.26	115.68	119.3	7	104.07	99.85	8	6.17	79.85	91.63	3	92.72	108.06	117.95	128.0	)9		(62)
Solar DH	-IW input	calculated	using A	ppe	endix G or	· Appendix	: H (	negativ	ve quantity	) (entei	r '0' if	f no solai	r contrib	ution to wate	er heatir	ng)		
(add a	dditiona	al lines if	FGHF	RS a	and/or \	WWHRS	ap	plies,	see Ap	pendix	kG)	1						
(63)m=	0	0	0		0	0		0	0	0		0	0	0	0			(63)
Output	from w	ater hea	ter			-								-	-			
(64)m=	132.26	115.68	119.3	7	104.07	99.85	8	6.17	79.85	91.63	3	92.72	108.06	117.95	128.0	)9		
							•			0	utput	t from wa	ater heat	er (annual)	112		1275.68	(64)
Heat g	ains fro	m water	heatir	ng,	kWh/m	onth 0.2	5 ´	[0.85	× (45)m	+ (61	)m]	+ 0.8 x	(46)n	า + (57)m	+ (59)	)m [	]	
(65)m=	33.07	28.92	29.84	4	26.02	24.96	2	1.54	19.96	22.91	1	23.18	27.01	29.49	32.02	2		(65)
inclu	Ide (57)	m in calo	ulatio	n o	f (65)m	only if c	vlir	nder is	s in the c	dwellir		r hot w	ater is	from com	munity	 v he	eating	
	. ,	ains (see			. ,	-	,				Ū				-	,	Ŭ	
Melabo	Jan	ns (Table Feb	, <u>5), W</u> Ma		S Apr	May		Jun	Jul	Au		Sep	Oct	Nov	De	c		
(66)m=	128.81	128.81	128.8	-	128.81	128.81	-	28.81	128.81	128.8	-	128.81	128.81		128.8			(66)
		(calcula																
(67)m=	20.97	18.63	15.1	<u> </u>	11.47	2, equal 8.57	i —	7.24	19a), a	10.16		13.64	17.32	20.22	21.55	5		(67)
														20.22	21.50	5		(01)
		ins (calc	r	<b>_</b>			r —				_			007.05	000 4			(69)
(68)m=	232.68	235.1	229.0		216.06	199.71		84.34	174.07	171.6		177.74	190.7	207.05	222.4	2		(68)
	<u> </u>	s (calcula	· · · · ·	<u> </u>		· · ·	-								<del></del>	_		(22)
(69)m=	35.88	35.88	35.88	3	35.88	35.88	3	5.88	35.88	35.88	3	35.88	35.88	35.88	35.88	8		(69)
Pumps	and fa	ns gains	(Tabl	e 5	a)											_		
(70)m=	0	0	0		0	0		0	0	0		0	0	0	0			(70)
Losses	s e.g. ev	/aporatic	n (neg	gati	ve valu	es) (Tab	le	5)								_		
(71)m=	-103.05	-103.05	-103.0	)5	-103.05	-103.05	-1	03.05	-103.05	-103.0	95 -	103.05	-103.05	-103.05	-103.0	)5		(71)
Water	heating	gains (T	able §	5)														
(72)m=	44.44	43.03	40.1 <i>°</i>	1	36.13	33.55	2	9.92	26.83	30.79	9	32.19	36.31	40.96	43.04	4		(72)
Total i	nterna	gains =						(66)	m + (67)m	+ (68)ı	m + (	(69)m + (	(70)m +	71)m + (72	)m			
(73)m=	359.74	358.4	345.9	1	325.3	303.48	28	83.14	270.37	274.2	6	285.22	305.97	329.86	348.6	65		(73)
6. Sol	lar gain	s:	•												•			
Solar g	ains are	calculated	using s	olar	flux from	Table 6a	and	associ	ated equa	tions to	con	vert to th	e applica	able orienta	tion.			
Orienta		Access F			Area			Flu				g_		FF			Gains	
		Table 6d			m²			Tat	ole 6a		Tal	ble 6b		Table 6c			(W)	
Southe	ast <mark>0.9x</mark>	0.77		x	6.	1	x	3	6.79	x		0.63	x	0.7		= [	68.56	(77)
Southe	ast <mark>0.9x</mark>	0.77		x	6.	1	x	6	2.67	x	(	0.63	x	0.7		= [	116.78	(77)
Southe	ast <mark>0.9x</mark>	0.77		x	6.	1	x	8	5.75	×	(	0.63	×	0.7		= [	159.78	(77)
Southe	ast <mark>0.9x</mark>	0.77		x	6.	1	x	1(	06.25	x	(	0.63	×	0.7		= [	197.98	(77)
Southe	ast <mark>0.9x</mark>	0.77		x	6.	1	x	1	19.01	x	(	0.63	×	0.7		= [	221.76	(77)

								_							
Southeast 0.9x	0.77	×	6	.1	x	1	18.15	x		0.63	x	0.7	=	220.15	(77)
Southeast 0.9x	0.77	x	6	.1	x	1	13.91	x		0.63	x	0.7	=	212.25	(77)
Southeast 0.9x	0.77	x	6	.1	x	1	04.39	x		0.63	x	0.7	=	194.51	(77)
Southeast 0.9x	0.77	x	6	.1	x	9	2.85	x		0.63	x	0.7	=	173.01	(77)
Southeast 0.9x	0.77	×	6	.1	x	6	9.27	x		0.63	×	0.7	=	129.07	(77)
Southeast 0.9x	0.77	×	6	.1	x	4	4.07	x		0.63	x	0.7	=	82.12	(77)
Southeast 0.9x	0.77	×	6	.1	x	3	31.49	x		0.63	x	0.7	=	58.67	(77)
Southwest <sub>0.9x</sub>	0.77	x	6	07	x	3	6.79	]		0.63	x	0.7	=	68.31	(79)
Southwest <sub>0.9x</sub>	0.77	x	6.	07	x	6	2.67			0.63	x	0.7	=	116.36	(79)
Southwest0.9x	0.77	x	6.	07	x	8	5.75	]		0.63	x	0.7	=	159.21	(79)
Southwest <sub>0.9x</sub>	0.77	×	6	07	x	1	06.25	]		0.63	x	0.7	=	197.27	(79)
Southwest <sub>0.9x</sub>	0.77	×	6	07	x	1	19.01	]		0.63	x	0.7	=	220.96	(79)
Southwest <sub>0.9x</sub>	0.77	×	6	07	x	1	18.15	]		0.63	x	0.7	=	219.36	(79)
Southwest <sub>0.9x</sub>	0.77	×	6	07	x	1	13.91	1		0.63	x	0.7	=	211.48	(79)
Southwest <sub>0.9x</sub>	0.77	×	6.	07	x	1	04.39	ĺ		0.63	x	0.7	=	193.81	(79)
Southwest <sub>0.9x</sub>	0.77	×	6.	07	x	9	2.85	ĺ		0.63	x	0.7	=	172.39	(79)
Southwest <sub>0.9x</sub>	0.77	×	6.	07	x	6	9.27	ĺ		0.63	x	0.7	=	128.6	(79)
Southwest <sub>0.9x</sub>	0.77	×	6.	07	x	4	4.07	1		0.63	x	0.7	=	81.82	(79)
Southwest <sub>0.9x</sub>	0.77	×	6.	07	x	3	31.49	i		0.63	×	0.7	=	58.46	(79)
Northwest 0.9x	0.77	×	4.	58	x	1	1.28	x		0.63	x	0.7	=	15.79	(81)
Northwest 0.9x	0.77	×	4.	58	x	2	2.97	x		0.63	×	0.7	=	32.14	(81)
Northwest 0.9x	0.77	×	4.	58	x	4	1.38	x		0.63	×	0.7	=	57.91	(81)
Northwest 0.9x	0.77	×	4.	58	x	6	57.96	x		0.63	×	0.7	=	95.1	(81)
Northwest 0.9x	0.77	×	4.	58	x	9	1.35	x		0.63	×	0.7	=	127.83	(81)
Northwest 0.9x	0.77	×	4.	58	x	9	7.38	x		0.63	×	0.7	=	136.28	(81)
Northwest 0.9x	0.77	×	4.	58	x		91.1	×		0.63	×	0.7	=	127.49	(81)
Northwest 0.9x	0.77	×	4.	58	x	7	2.63	x		0.63	x	0.7	=	101.63	(81)
Northwest 0.9x	0.77	×	4.	58	x	5	0.42	x		0.63	x	0.7	=	70.56	(81)
Northwest 0.9x	0.77	×	4.	58	x	2	8.07	x		0.63	x	0.7	=	39.28	(81)
Northwest 0.9x	0.77	×	4.	58	x		14.2	x		0.63	x	0.7	=	19.87	(81)
Northwest 0.9x	0.77	×	4.	58	x		9.21	x		0.63	x	0.7	=	12.89	(81)
								-	-						
Solar gains in	watts, ca	lculate	d for eac	h mont	:h			(83)m	n = Su	ım(74)m .	(82)m				
(83)m= 152.66		376.9	490.35	570.54		75.79	551.22	489	9.96	415.96	296.9	5 183.81	130.03		(83)
Total gains –	internal a	nd sola	r (84)m	= (73)n	ו + ( י	83)m	, watts							1	
(84)m= 512.4	623.68	722.81	815.65	874.02	2 8	58.93	821.59	764	.21	701.18	602.92	2 513.67	478.68		(84)
7. Mean inte	rnal temp	erature	(heating	g seasc	n)										
Temperature	e during h	eating	periods	n the liv	ving	area	from Tab	ole 9	, Th1	1 (°C)				21	(85)
Utilisation fa	ctor for ga	ains for	living ar	ea, h1,	m (s	ee Ta	ble 9a)	-							
Jan	Feb	Mar	Apr	May	/	Jun	Jul	A	ug	Sep	Oct	Nov	Dec		
(86)m= 1	0.99	0.98	0.94	0.84		0.66	0.49	0.5	54	0.8	0.97	1	1	]	(86)
Mean interna	al tempera	ature in	living a	ea T1 (	follc	ow ste	ps 3 to 7	7 in T	Table	e 9c)					
(87)m= 19.81	20	20.27	20.6	20.85	<u> </u>	20.97	20.99	20.	- 1	20.91	20.57	20.13	19.78		(87)
L			•	-			•	-						•	

Temp	erature	during h	eating p	eriods ir	n rest of	dwelling	from Ta	able 9, T	h2 (°C)					
(88)m=	20	20	20	20.01	20.02	20.03	20.03	20.03	20.02	20.02	20.01	20.01		(88)
Utilisa	ation fac	tor for g	ains for	rest of d	welling,	h2,m (se	e Table	9a)						
(89)m=	1	0.99	0.98	0.92	0.79	0.57	0.38	0.43	0.72	0.95	0.99	1		(89)
Mean	interna	l temper	ature in	the rest	of dwelli	ng T2 (f	ollow ste	eps 3 to	7 in Tabl	e 9c)				
(90)m=	18.91	19.1	19.37	19.7	19.92	20.01	20.03	20.03	19.98	19.68	19.24	18.89		(90)
						•		•	f	LA = Livin	g area ÷ (4	4) =	0.34	(91)
Mean	interna	l temper	ature (fo	or the wh	ole dwe	llina) – f	Ι Δ 🗙 Τ1	+ (1 – fl	A) x T2			•		_
(92)m=	19.22	19.41	19.68	20.01	20.24	20.34	20.36	20.36	20.3	19.99	19.54	19.2		(92)
			L he mear	internal	l temper	ı ature fro	n I Table	i 4e. whe	ere appro	poriate				
(93)m=	19.22	19.41	19.68	20.01	20.24	20.34	20.36	20.36	20.3	19.99	19.54	19.2		(93)
	ace hea	ting requ	uirement											
					re obtair	ed at st	ep 11 of	Table 9	b, so tha	t Ti.m=(	76)m an	d re-calc	ulate	
				using Ta					-,	, (				
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa	ation fac	tor for g	ains, hm	n:										
(94)m=	1	0.99	0.98	0.92	0.8	0.6	0.42	0.47	0.75	0.95	0.99	1		(94)
Usefu	I gains,	hmGm	, W = (9	4)m x (84	4)m		•							
(95)m=	510.79	618.23	704.9	753.57	699.84	514.18	345.19	361.09	524.84	574.33	509.87	477.61		(95)
Month	nly aver	age exte	rnal tem	perature	from Ta	able 8								
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat	loss rate	e for mea	an interr	al tempe	erature,	Lm,W:	∙ =[(39)m∶	r x [(93)m	– (96)m	]				
(97)m=	1427.95	1384.22	1253.51	1041.64	798.63	530.4	347.21	364.76	575.38	877.96	1170.23	1418.33		(97)
Space	e heatin	a require	ement fo	r each n	nonth, k\	Wh/mon <sup>·</sup>	th = 0.02	24 x [(97	)m – (95	)m] x (4 <sup>-</sup>	1)m			
Space (98)m=	e heatin 682.37	g require 514.75	ement fc 408.17	or each n 207.41	nonth, k 73.5	Wh/mon <sup>-</sup>	th = 0.02	24 x [(97 0	)m – (95 0	)m] x (4 <sup>-</sup> 225.9	1)m 475.46	699.89		
		<u> </u>	i	i	1	1	1	0	0	225.9	475.46		3287.46	(98)
(98)m=	682.37	514.75	408.17	i	73.5	1	1	0	í i	225.9	475.46		3287.46	(98) (99)
(98)m=	682.37 e heatin	514.75	408.17 ement in	207.41 kWh/m <sup>2</sup>	73.5	1	1	0	0	225.9	475.46			
(98)m= Space 8c. Sp	682.37 e heatin pace co	514.75 g require	408.17 ement in juiremer	207.41 kWh/m <sup>2</sup>	73.5 ²/year	0	1	0	0	225.9	475.46			
(98)m= Space 8c. Sp	682.37 e heatin bace co lated fo	514.75 g require	408.17 ement in juiremer	207.41 kWh/m² nt August.	73.5 ²/year See Tal	0 ole 10b	0	0 Tota	0 Il per year	225.9 (kWh/year	475.46 r) = Sum(9	8)15,912 =		
(98)m= Space 8c. Sp Calcu	682.37 e heatin bace co lated fo Jan	514.75 g require oling rec r June, C Feb	408.17 ement in juiremer July and Mar	207.41 kWh/m² nt August. Apr	73.5 ²/year See Tal May	0 ole 10b Jun	Jul	0 Tota Aug	0 Il per year Sep	225.9 (kWh/year Oct	475.46 •) = Sum(9) Nov	8) <sub>15,912</sub> =		
(98)m= Space 8c. Sp Calcu	682.37 e heatin pace co lated fo Jan loss rate	514.75 g require oling rec r June, C Feb	408.17 ement in juiremer July and Mar	207.41 kWh/m² nt August. Apr	73.5 ²/year See Tal May	0 ole 10b Jun	Jul	0 Tota Aug	0 Il per year	225.9 (kWh/year Oct	475.46 •) = Sum(9) Nov	8) <sub>15,912</sub> =		
(98)m= Space 8c. Sp Calcu Heat (100)m=	682.37 e heatin bace co lated fo Jan loss rate 0	514.75 g require oling rec r June, C Feb e Lm (ca	408.17 ement in juiremen July and Mar Iculated 0	207.41 kWh/m <sup>2</sup> nt August. Apr using 25	73.5 <sup>2</sup> /year See Tal May 5°C inter	0 ble 10b Jun mal temp	0 Jul perature	0 Tota Aug and ext	0 Il per year Sep ernal ten	225.9 (kWh/year Oct	475.46 ) = Sum(9) Nov e from T	8)15,912 = Dec able 10)		(99)
(98)m= Space 8c. Sp Calcu Heat (100)m=	682.37 e heatin bace co lated fo Jan loss rate 0 ation fac	514.75 g require oling rec r June, Feb e Lm (ca 0	408.17 ement in juiremen July and Mar Iculated 0	207.41 kWh/m <sup>2</sup> nt August. Apr using 25	73.5 <sup>2</sup> /year See Tal May 5°C inter	0 ble 10b Jun mal temp	0 Jul perature	0 Tota Aug and ext	0 Il per year Sep ernal ten	225.9 (kWh/year Oct	475.46 ) = Sum(9) Nov e from T	8)15,912 = Dec able 10)		(99)
(98)m= Space 8c. Sp Calcu Heat (100)m= Utilisa (101)m=	682.37 e heatin bace co lated fo Jan loss rate 0 ation fac	514.75 g require oling rec r June, C Feb e Lm (ca 0 tor for lc 0	408.17 ement in juiremen July and Mar Iculated 0 sss hm 0	207.41 kWh/m <sup>2</sup> nt August. Apr using 25 0	73.5 2/year See Tal May 5°C inter 0	0 ble 10b Jun nal tem 868.17 0.92	0 Jul perature 683.45	0 Tota Aug and extr 700.28	0 Il per year Sep ernal ten 0	225.9 (kWh/year Oct nperatur 0	475.46 ) = Sum(9) Nov e from T 0	8)15,912 = Dec able 10) 0		(100)
(98)m= Space 8c. Sp Calcu Heat (100)m= Utilisa (101)m= Usefu	682.37 e heatin bace co lated fo Jan loss rate 0 ation fac	514.75 g require oling rec r June, C Feb e Lm (ca 0 tor for lc 0	408.17 ement in juiremen July and Mar Iculated 0 sss hm 0	207.41 kWh/m <sup>2</sup> August. Apr using 25 0	73.5 2/year See Tal May 5°C inter 0	0 ble 10b Jun nal tem 868.17 0.92	0 Jul perature 683.45	0 Tota Aug and extr 700.28	0 Il per year Sep ernal ten 0	225.9 (kWh/year Oct nperatur 0	475.46 ) = Sum(9) Nov e from T 0	8)15,912 = Dec able 10) 0		(100)
(98)m= Space 8c. St Calcu Heat (100)m= Utilisa (101)m= Usefu (102)m=	682.37 e heatin bace co lated fo Jan loss rate 0 ation fac 0 I loss, h 0	514.75 g require oling rec r June, Feb e Lm (ca 0 tor for lc 0 mLm (V 0	408.17 ement in July and Mar Iculated 0 pss hm 0 Vatts) = 1 0	207.41 kWh/m <sup>2</sup> August. Apr using 25 0 0 (100)m x 0	73.5 /year See Tal May 5°C inter 0 (101)m 0	0 ble 10b Jun nal temp 868.17 0.92 801.79	0 Jul perature 683.45 0.96 658.16	0 Tota Aug and extr 700.28 0.95 664.09	0 Il per year Sep ernal tem 0 0	225.9 (kWh/year Oct nperatur 0	475.46 ) = Sum(9) Nov e from T 0 0	8)15,912 = Dec able 10) 0		(99) (100) (101)
(98)m= Space 8c. Sp Calcu Heat (100)m= Utilisa (101)m= Usefu (102)m= Gains	682.37 e heatin bace co lated fo Jan loss rate 0 ation fac 0 I loss, h 0	514.75 g require oling rec r June, Feb e Lm (ca 0 tor for lc 0 mLm (V 0	408.17 ement in July and Mar Iculated 0 pss hm 0 Vatts) = 1 0	207.41 kWh/m <sup>2</sup> August. Apr using 25 0 (100)m x	73.5 /year See Tal May 5°C inter 0 (101)m 0	0 ole 10b Jun nal temp 868.17 0.92 801.79 eather re	0 Jul perature 683.45 0.96 658.16 egion, se	0 Tota Aug and extr 700.28 0.95 664.09 ee Table	0 Il per year Sep ernal tem 0 0	225.9 (kWh/year Oct nperatur 0	475.46 ) = Sum(9) Nov e from T 0 0	8)15,912 = Dec able 10) 0		(99) (100) (101)
(98)m= Space 8c. Space Calcu Heat (100)m= Utilisa (101)m= Usefu (102)m= Gains (103)m=	682.37 e heatin bace co lated fo Jan loss rate 0 ation fac 0 il loss, h 0 s (solar g 0	514.75 g require oling rec r June, C Feb e Lm (ca 0 tor for lc 0 mLm (V 0 gains ca 0	408.17 ement in juirement July and Mar Iculated 0 ss hm 0 vatts) = 1 0 lculated 0	207.41 kWh/m <sup>2</sup> August. Apr using 25 0 (100)m x 0 for appli 0	73.5 /year See Tal May 5°C inter 0 (101)m 0 cable we 0	0 ble 10b Jun nal temp 868.17 0.92 801.79 eather re 1100.7	0 Jul perature 683.45 0.96 658.16 egion, se 1055.03	0 Tota Aug and extr 700.28 0.95 664.09 ee Table 989.64	0 Il per year Sep ernal tem 0 0 10) 0	225.9 (kWh/year Oct nperatur 0 0 0	475.46 •) = Sum(9) •) = Sum(9	8)15.912 = Dec able 10) 0 0	37.96	(100) (101) (102)
(98)m= Space 8c. Sp Calcu Heat (100)m= Utilisa (101)m= Usefu (102)m= Gains (103)m= Space	682.37 e heatin pace co lated fo Jan loss rate 0 ation fac 0 l loss, h 0 s (solar g 0 e cooling	514.75 g require oling rec r June, C Feb e Lm (ca 0 ttor for lc 0 mLm (W 0 gains ca 0 g require	408.17 ement in juiremen July and Mar Iculated 0 oss hm 0 /atts) = 0 Iculated 0 culated	207.41 kWh/m <sup>2</sup> August. Apr using 25 0 (100)m x 0 for appli 0	73.5 2/year See Tal May 5°C inter 0 (101)m 0 (101)m 0 cable we 0 whole c	0 ble 10b Jun nal temp 868.17 0.92 801.79 eather re 1100.7	0 Jul perature 683.45 0.96 658.16 egion, se 1055.03	0 Tota Aug and extr 700.28 0.95 664.09 ee Table 989.64	0 Il per year ernal tem 0 0 10)	225.9 (kWh/year Oct nperatur 0 0 0	475.46 •) = Sum(9) •) = Sum(9	8)15.912 = Dec able 10) 0 0	37.96	(100) (101) (102)
(98)m= Space 8c. Sp Calcu Heat (100)m= Utilisa (101)m= Usefu (102)m= Gains (103)m= Space	682.37 e heatin pace co lated fo Jan loss rate 0 ation fac 0 l loss, h 0 s (solar g 0 e cooling	514.75 g require oling rec r June, C Feb e Lm (ca 0 ttor for lc 0 mLm (W 0 gains ca 0 g require	408.17 ement in juiremen July and Mar Iculated 0 oss hm 0 /atts) = 0 Iculated 0 culated	207.41 kWh/m <sup>2</sup> August. Apr using 28 0 0 (100)m x 0 for appli 0 <i>r month,</i>	73.5 2/year See Tal May 5°C inter 0 (101)m 0 (101)m 0 cable we 0 whole c	0 ble 10b Jun nal temp 868.17 0.92 801.79 eather re 1100.7	0 Jul perature 683.45 0.96 658.16 egion, se 1055.03	0 Tota Aug and extr 700.28 0.95 664.09 ee Table 989.64	0 Il per year Sep ernal tem 0 0 10) 0	225.9 (kWh/year Oct nperatur 0 0 0	475.46 •) = Sum(9) •) = Sum(9	8)15.912 = Dec able 10) 0 0	37.96	(100) (101) (102)
(98)m= Space 8c. Sf Calcu Heat (100)m= Utilisa (101)m= Usefu (102)m= Gains (103)m= <i>Space</i> set (1	682.37 e heatin pace cool lated fo Jan doss rate 0 ation fac 0 ation fac 0 ation fac 0 s (solar s 0 c (solar s 0 0 e coolins	514.75 g require oling rec r June, C Feb e Lm (ca 0 tor for lo 0 tor for lo 0 mLm (W 0 gains ca 0 g require zero if (	408.17 ement in juirement July and Mar Iculated 0 oss hm 0 /atts) = 0 lculated 0 lculated 0 ement fo 104)m <	207.41 kWh/m <sup>2</sup> August. Apr using 25 0 (100)m x 0 for appli 0 r month, < 3 × (98	73.5 /year See Tal May 5°C inter 0 (101)m 0 (101)m 0 cable we 0 whole c )m	0 ole 10b Jun nal temp 868.17 0.92 801.79 eather re 1100.7 <i>dwelling,</i>	0 Jul perature 683.45 0.96 658.16 egion, se 1055.03 continue	0 Tota Aug and exte 700.28 0.95 664.09 ee Table 989.64 ous ( kM	0 I per year Sep ernal tem 0 10) 0 10) 0 /h) = 0.02 0	225.9 (kWh/year Oct nperatur 0 0 0 24 x [(10	475.46 •) = Sum(9) •) = Sum(9) • • • • • • • • • • • • •	8)15.912 = Dec able 10) 0 0 0 102)m ] >	37.96	(100) (101) (102)
(98)m= Space 8c. Sf Calcu Heat (100)m= Utilisa (101)m= Usefu (102)m= Gains (103)m= Space set (1 (104)m=	682.37 e heatin pace cool lated fo Jan doss rate 0 ation fac 0 ation fac 0 ation fac 0 s (solar s 0 c (solar s 0 0 e coolins	514.75 g require oling red r June, C Feb e Lm (ca 0 tor for lo 0 mLm (W 0 gains ca 0 g require zero if ( 0	408.17 ement in juirement July and Mar Iculated 0 oss hm 0 /atts) = 0 lculated 0 lculated 0 ement fo 104)m <	207.41 kWh/m <sup>2</sup> August. Apr using 25 0 (100)m x 0 for appli 0 r month, < 3 × (98	73.5 /year See Tal May 5°C inter 0 (101)m 0 (101)m 0 cable we 0 whole c )m	0 ole 10b Jun nal temp 868.17 0.92 801.79 eather re 1100.7 <i>dwelling,</i>	0 Jul perature 683.45 0.96 658.16 egion, se 1055.03 continue	0 Tota Aug and exte 700.28 0.95 664.09 ee Table 989.64 ous ( kM	0 I per year Pernal tem 0 10) 0 10) 0 10) 0 10) 0 Total	225.9 (kWh/year 0 0 0 24 x [(10 0 = Sum(	475.46 •) = Sum(9) •) = Sum(9) • • • • • • • • • • • • •	B)15,912 = Dec able 10) 0 0 0 102)m ] > 0 =	37.96 < (41)m	(100) (101) (102) (103)
(98)m= Space 8c. Space Calcu Heat (100)m= Utilisa (101)m= Usefu (102)m= Gains (103)m= Space set (1 (104)m= Coolect	682.37 e heatin pace cool lated fo Jan loss rate 0 ation fac 0 ation fac 0 s (solar g 0 s (solar g 0 e cooling 0 d)m to 0	514.75 g require oling red r June, C Feb e Lm (ca 0 tor for lo 0 mLm (W 0 gains ca 0 g require zero if ( 0	408.17 ement in juirement July and Mar Iculated 0 ess hm 0 /atts) = 0 lculated 0 lculated 0 ement fo 104)m <	207.41 kWh/m <sup>2</sup> August. Apr using 25 0 0 (100)m x 0 (100)m x 0 for appli 0 for appli 0 r month, 3 x (98 0	73.5 /year See Tal May 5°C inter 0 (101)m 0 (101)m 0 cable we 0 whole c )m	0 ole 10b Jun nal temp 868.17 0.92 801.79 eather re 1100.7 <i>dwelling,</i>	0 Jul perature 683.45 0.96 658.16 egion, se 1055.03 continue	0 Tota Aug and exte 700.28 0.95 664.09 ee Table 989.64 ous ( kM	0 I per year Pernal tem 0 10) 0 10) 0 10) 0 10) 0 Total	225.9 (kWh/year 0 0 0 24 x [(10 0 = Sum(	475.46 1 = Sum(9) 1 = Sum(9) 0 0 0 0 0 0 0 0	B)15,912 = Dec able 10) 0 0 0 102)m ] > 0 =	37.96 < (41)m 752.71	(100) (101) (102) (103)
(98)m= Space 8c. Space Calcu Heat (100)m= Utilisa (101)m= Usefu (102)m= Gains (103)m= Space set (1 (104)m= Coolect	682.37 e heatin pace cool lated fo Jan loss rate 0 ation fac 0 ation fac 0 s (solar g 0 s (solar g 0 e cooling 0 d)m to 0	514.75 g require oling rec r June, C Feb e Lm (ca 0 tor for lc 0 mLm (V 0 gains ca 0 g require zero if ( 0	408.17 ement in juirement July and Mar Iculated 0 ess hm 0 /atts) = 0 lculated 0 lculated 0 ement fo 104)m <	207.41 kWh/m <sup>2</sup> August. Apr using 25 0 0 (100)m x 0 (100)m x 0 for appli 0 for appli 0 r month, 3 x (98 0	73.5 /year See Tal May 5°C inter 0 (101)m 0 (101)m 0 cable we 0 whole c )m	0 ole 10b Jun nal temp 868.17 0.92 801.79 eather re 1100.7 <i>dwelling,</i>	0 Jul perature 683.45 0.96 658.16 egion, se 1055.03 continue	0 Tota Aug and exte 700.28 0.95 664.09 ee Table 989.64 ous ( kM	0 I per year Pernal tem 0 10) 0 10) 0 10) 0 10) 0 Total	225.9 (kWh/year 0 0 0 24 x [(10 0 = Sum(	475.46 1 = Sum(9) 1 = Sum(9) 0 0 0 0 0 0 0 0	B)15,912 = Dec able 10) 0 0 0 102)m ] > 0 =	37.96 < (41)m 752.71	(100) (101) (102) (103)
(98)m= Space 8c. Sf Calcu Heat (100)m= Utilisa (101)m= Usefu (102)m= Gains (103)m= Space set (1 (104)m= Coolecc Intermi	682.37 e heatin bace cooling lated fo Jan loss rate 0 ation fac 0 ation fac 0 il loss, h 0 i (solar ( 0 e cooling 04)m to 0 fraction ttency fac	514.75 g require oling req r June, C Feb e Lm (ca 0 tor for lc 0 mLm (W 0 gains ca 0 g require zero if ( 0	408.17 ement in juirement July and Mar Iculated 0 ss hm 0 /atts) = 0 lculated 0 lculated 0 lculated 0 ement fo 104)m < 0	207.41 kWh/m <sup>2</sup> August. Apr using 25 0 (100)m x 0 for appli 0 r month, 3 x (98 0	73.5 2/year See Tal May 5°C inter 0 (101)m 0 (101)m 0 cable we 0 whole c )m 0	0 ole 10b Jun nal temp 868.17 0.92 801.79 eather re 1100.7 <i>dwelling,</i> 215.22	0 Jul perature 683.45 0.96 658.16 egion, se 1055.03 continue 295.28	0 Tota Aug and extr 700.28 0.95 664.09 989.64 989.64 0us ( kM 242.22	0 I per year ernal tem 0 10) 0 10) 0 10) 0 /h) = 0.02 0 Total f C = 0	225.9 (kWh/year 0 0 0 24 x [(10 0 = Sum( cooled a	$\frac{475.46}{1000}$	$B)_{15,912} = 0$ $Dec$ $able 10)$ $0$ $0$ $0$ $102)m] > 0$ $0$ $=$ $b) = 0$	37.96 < (41)m 752.71	(100) (101) (102) (103)

Space	cooling	requirer	nent for	month =	(104)m	× (105)	× (106)r	n	-	-	-	-	_		
(107)m=															
-	Total = Sum(10.7) =														
Space	bace cooling requirement in kWh/m <sup>2</sup> /year $(107) \div (4) =$														
8f. Fab	ric Enei	rgy Effici	iency (ca	alculated	l only un	der spec	cial cond	litions, s	ee sectio	on 11)					
Fabric	Energ	y Efficier	псу						(99)	+ (108) =	=		40.13	(109)	
Targe	t Fabri	c Energ	y Efficie	ency (TF	EE)								46.15	(109)	

		Use	er Details:						
Assessor Name:	Zahid Ashraf		Stroma	a Numl	per:		STRO	001082	
Software Name:	Stroma FSAP 20	12	Softwa	re Ver	sion:		Versio	n: 1.0.5.9	
		Prope	rty Address:	Plot 19					
Address :									
1. Overall dwelling dime	nsions:				_				
Ground floor			Area(m²) 86.6	(1a) x	<b>Av. He</b> i	ight(m) 2.5	(2a) =	<b>Volume(m</b> <sup>3</sup> 216.5	<b>3)</b> (3a)
Total floor area TFA = (1a	a)+(1b)+(1c)+(1d)+(1	e)+(1n)	86.6	(4)					_
Dwelling volume				(3a)+(3b)	+(3c)+(3d	)+(3e)+	.(3n) =	216.5	(5)
2. Ventilation rate:									
		secondary heating	other		total			m <sup>3</sup> per hou	r
Number of chimneys	0 +	0 +	0	] = [	0	x 4	40 =	0	(6a)
Number of open flues	0 +	0 +	0	] = [	0	x 2	20 =	0	(6b)
Number of intermittent fa	ns				0	<b>x</b> 1	10 =	0	(7a)
Number of passive vents					0	x 1	10 =	0	(7b)
Number of flueless gas fi	res				0	x 4	40 =	0	(7c)
							ا Air ch	anges per ho	
	<i>a</i> 1 <i>a a</i>	0-)-(0-)-(7-)-(7	1. ) . ( <b>7</b> . )					anges per no	_
Infiltration due to chimney If a pressurisation test has b				ontinue fra	$\frac{0}{m(9) to (}$		÷ (5) =	0	(8)
Number of storeys in th			<i>i i ),</i> outor wide o		<i>iiii</i> (0) to (	10)	[	0	(9)
Additional infiltration	0 ( )					[(9)-	-1]x0.1 =	0	(10)
Structural infiltration: 0.	25 for steel or timber	frame or 0.35	5 for masonr	y constru	uction		İ	0	(11)
if both types of wall are pr deducting areas of openir		sponding to the g	greater wall area	a (after					
If suspended wooden f		aled) or 0.1 (se	ealed), else (	enter 0			I	0	(12)
If no draught lobby, ent		, (	,.					0	(13)
Percentage of windows	and doors draught	stripped						0	(14)
Window infiltration			0.25 - [0.2	x (14) ÷ 10	= [00			0	(15)
Infiltration rate			(8) + (10) +	+ (11) + (12	2) + (13) +	+ (15) =		0	(16)
Air permeability value,					etre of e	nvelope	area	3	(17)
If based on air permeabil	•							0.15	(18)
Air permeability value applie. Number of sides sheltere		as been done or a	a degree air per	meability i	s being us	sed	1		
Shelter factor	u		(20) = 1 - [	0.075 x (1	9)] =			0.92	(19) (20)
Infiltration rate incorporat	ing shelter factor		(21) = (18)	x (20) =				0.14	(21)
Infiltration rate modified for	0	d					I		
Jan Feb	Mar Apr May	Jun Ju	ul Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	eed from Table 7								
(22)m= 5.1 5	4.9 4.4 4.3	3.8 3.8	8 3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m = (22	2)m ÷ 4								
	1.23 1.1 1.08	0.95 0.9	95 0.92	1	1.08	1.12	1.18		
······		•		•		-			

Adjuste	ed infiltr	ation rat	e (allowi	ng for sh	elter an	d wind s	peed) =	(21a) x	(22a)m					
	0.18	0.17	0.17	0.15	0.15	0.13	0.13	0.13	0.14	0.15	0.16	0.16		
		c <i>tive air</i> al ventila	change i	rate for t	he appli	cable ca	se						0.5	(220)
				endix N, (2	3b) = (23a	ı) × Fmv (e	equation (1	N5)) , other	wise (23b	) = (23a)			0.5 0.5	(23a) (23b)
								n Table 4h)		, , ,			79.05	(23c)
			-	-	-					2b)m + (	23b) x [	1 – (23c)		(200)
(24a)m=		0.28	0.27	0.26	0.25	0.24	0.24	0.23	0.24	0.25	0.26	0.27	. 100]	(24a)
		d mecha	anical ve	ntilation	without	heat rec	L Coverv (N	иV) (24b	)m = (22	1 2b)m + (;	1 23b)			
(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24b)
c) If	whole h	use ex	tract ven	tilation c	or positiv	re input v	r ventilatio	n from a	outside					
					•	•		c) = (22b		.5 × (23b	)			
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24c)
,					•	-		on from l 0.5 + [(2		0.5]				
(24d)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24d)
Effe	ctive air	change	rate - er	iter (24a	) or (24b	o) or (24	c) or (24	d) in box	(25)			-		
(25)m=	0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.23	0.24	0.25	0.26	0.27		(25)
3. He	at losse	s and he	eat loss p	paramete	er:									
ELEN		Gros		Openin		Net Ar	ea	U-valu	le	AXU		k-value	e /	A X k
		area	(m²)	m	2	A ,n	n²	W/m2	к <u>.</u>	(W/I	<u>&lt;)</u>	kJ/m²∙ł	< ł	⟨J/K
Doors						2	x	1.4	=	2.8				(26)
Windo	ws Type	e 1				6.097	y x1,	/[1/( 1.4 )+	0.04] =	8.08				(27)
Windo	ws Type	2				6.075	5 x1	/[1/( 1.4 )+	0.04] =	8.05				(27)
Windo	ws Type	93				4.579	) x1,	/[1/( 1.4 )+	0.04] =	6.07				(27)
Floor						9.39	x	0.12	=	1.1268				(28)
Walls 7	Type1	78.7	<b>'</b> 5	16.75	5	62	x	0.15	=	9.3				(29)
Walls 7	Type2	14.3	37	2		12.37	' X	0.14	=	1.75				(29)
Walls <sup>-</sup>	ТуреЗ	12.5	56	0		12.56	3 X	0.13	=	1.66	Ī		$\neg \square$	(29)
Total a	rea of e	lements	, m²			115.0	8							(31)
			ows, use e sides of in				ated using	formula 1,	/[(1/U-valu	ie)+0.04] a	ns given in	paragraph	3.2	
Fabric	heat los	ss, W/K :	= S (A x	U)				(26)(30)	+ (32) =				38.85	(33)
Heat c	apacity	Cm = S(	(Axk)						((28).	(30) + (32	2) + (32a).	(32e) =	1921.35	(34)
Therm	al mass	parame	ter (TMF	? = Cm ÷	- TFA) in	n kJ/m²K			Indica	tive Value	Low		100	(35)
	-		ere the de tailed calcu		constructi	ion are not	t known pr	ecisely the	indicative	e values of	TMP in T	able 1f		
Therm	al bridge	es : S (L	x Y) cal	culated u	using Ap	pendix ł	<						12.71	(36)
			are not kn	own (36) =	= 0.05 x (3	1)			()	()				
	abric he									(36) =			51.56	(37)
Ventila		1	alculated						. ,	= 0.33 × (			l	
(29)~	Jan 20.12	Feb 19.88	Mar 19.63	Apr 18.39	May 18.14	Jun 16.9	Jul 16.9	Aug 16.65	Sep 17.4	Oct 18.14	Nov 18.64	Dec 19.13		(38)
(38)m=				10.39	10.14	10.9	10.9	10.00				19.13		(00)
Heat tr (39)m=	71.68	71.43	nt, VV/K 71.18	69.95	69.7	68.46	68.46	68.21	(39)m 68.95	= (37) + (3 69.7	38)m 70.19	70.69	l	
			: 1.0.5.9 (S					00.21		Average =			69.8 <b>8</b> ~~	ge 2 of 389)
Juonal		- • 0131011.								0.1	(/)		<u> </u>	<u>,                                    </u>

Heat lo	oss para	meter (H	HLP), W	/m²K					(40)m	= (39)m ÷	- (4)			
(40)m=	0.83	0.82	0.82	0.81	0.8	0.79	0.79	0.79	0.8	0.8	0.81	0.82		
Numbe	er of day	s in mo	nth (Tab	le 1a)		1				Average =	Sum(40)1.	12 /12=	0.81	(40)
Numbe	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Wa	ater heat	ing ene	rgy requ	irement:								kWh/ye	ear:	
if TF	ied occu A > 13.9 A £ 13.9	9, N = 1		: [1 - exp	(-0.0003	849 x (TF	FA -13.9	)2)] + 0.(	0013 x ( <sup>-</sup>	TFA -13		58		(42)
Reduce	the annua	al average	hot water		5% if the a	lwelling is	designed	(25 x N) to achieve		se target o		).41		(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate	er usage ii	n litres per	r day for ea	ach month	Vd,m = fa	ctor from T	Table 1c x	(43)						
(44)m=	110.45	106.43	102.41	98.4	94.38	90.37	90.37	94.38	98.4	102.41	106.43	110.45		<b>-</b>
Energy	content of	hot water	used - cal	lculated m	onthly $= 4$ .	190 x Vd,r	m x nm x L	OTm / 3600			m(44) <sub>112</sub> = ables 1b, 1		1204.88	(44)
(45)m=	163.79	143.25	147.82	128.88	123.66	106.71	98.88	113.47	114.82	133.81	146.07	158.62		
If instan	tonoouou	ator booti	ng of point	t of upp /nd	hot wata	( oforego)	ontor 0 in	hoven (46		Total = Su	m(45) <sub>112</sub> =	-	1579.79	(45)
			· ·				14.83	boxes (46)	i	20.07	04.04	00.70		(46)
(46)m= Water	24.57 storage	21.49 loss:	22.17	19.33	18.55	16.01	14.63	17.02	17.22	20.07	21.91	23.79		(40)
Storag	e volum	e (litres)	includir	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel	(	0		(47)
	•	•		ank in dw	•			i (47) ombi boil	ors) ont	or 'O' in (	(47)			
	storage		not wate	51 (1113 11	iciuues i	nstantai			ers) erite		<i>(11)</i>			
a) If m	nanufact	urer's de	eclared I	oss facto	or is kno	wn (kWł	n/day):				(	0		(48)
Tempe	erature fa	actor fro	m Table	2b								0		(49)
			-	e, kWh/ye				(48) x (49)	) =		1	10		(50)
,				cylinder l rom Tabl							0	02		(51)
		-	ee secti		- (		<i></i>				0.	02		
	e factor										1.	03		(52)
			m Table								0	.6		(53)
	/ lost fro (50) or (		-	e, kWh/ye	ear			(47) x (51)	) x (52) x (	53) =		03 03		(54) (55)
	. , .	. , .	,	for each	month			((56)m = (	55) × (41)	m	I.	03		(00)
(56)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(56)
											H11) is fro		ix H	()
(57)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)
Primar	y circuit	loss (ar	nual) fro	om Table	e 3							0		(58)
Primar	y circuit	loss cal	culated	for each	month (	,	. ,	65 × (41)						
			· · · · · ·	1	i	1		ng and a	· ·	i	, 	00.00		(50)
(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)

Combi	loss ca	alculated	for ea	ch	month (	61)m =	(60	)) ÷ 36	65 × (41)	)m									
(61)m=	0	0	0		0	0		0	0	0		0	0		0		C		(61)
Total h	eat rec	uired for	water	he	ating ca	alculated	d fo	r eac	h month	(62)n	า =	0.85 × (	(45)m	+	(46)m +	(57)	m +	(59)m + (61)m	
(62)m=	219.07	193.18	203.	1	182.37	178.94	1	60.2	154.16	168.7	74	168.32	189.0	)9	199.56	21	3.9		(62)
Solar DI	-IW input	calculated	using A	ppe	ndix G or	Appendix	(H)	(negati	ve quantity	/) (ente	r '0'	if no sola	r contri	but	tion to wate	er hea	ating)	-	
(add a	dditiona	al lines if	FGHF	RS a	and/or V	VWHRS	S ap	plies	, see Ap	pendi	хG	6)	_					_	
(63)m=	0	0	0		0	0		0	0	0		0	0		0		C		(63)
Output	from v	vater hea	iter																
(64)m=	219.07	193.18	203.	1	182.37	178.94	1	60.2	154.16	168.7	74	168.32	189.0	)9	199.56	21	3.9		
		-								C	Outp	ut from wa	ater he	ate	er (annual)₁	12		2230.63	(64)
Heat g	ains fro	om water	heatir	ng,	kWh/mo	onth 0.2	5 ′	[0.85	× (45)m	+ (61	)m	] + 0.8 ×	< [(46)	m	+ (57)m	+ (5	59)m	]	
(65)m=	98.68	87.57	93.3	7	85.65	85.34	7	8.28	77.1	81.9	5	80.97	88.7	1	91.36	96	.96		(65)
inclu	ide (57	)m in cal	culatio	n o	f (65)m	only if c	ylir	nder i	s in the o	dwellii	ng (	or hot w	ater i	s f	rom com	mur	ity h	heating	
5. Int	ternal o	ains (see	e Table	e 5	and 5a	):	•				-							-	
		ns (Table																	
metab	Jan	Feb	Ma		Apr	May	Γ	Jun	Jul	Au	a	Sep	00	t	Nov		ec	]	
(66)m=	154.58		154.5	-	154.58	154.58	-	54.58	154.58	154.5	<del>~  </del>	154.58	154.	-	154.58		1.58		(66)
Liahtin	a aains	s (calcula	ted in	Ap	pendix	. equat	ion	L9 o	r L9a), a	lso se	e T	Table 5	I					1	
(67)m=	52.42	46.56	37.8	<u> </u>	28.67	21.43	1	8.09	19.55	25.4	- 1	34.11	43.3	1	50.54	53	.88	ן	(67)
		ains (calc	L	l in	Annend	lix Lea		tion	13 or I 1	1 3a) a	  SO	see Ta	L ble 5					1	
(68)m=	347.29	350.89	341.8	- T	322.48	298.07	<u> </u>	75.13	259.81	256.2	<b>_</b>	265.29	284.0	52	309.03	33	.96	1	(68)
		s (calcula	L															J	. ,
(69)m=	53.03	53.03	53.0	-i	53.03	53.03	-	3.03	53.03	53.0	-	53.03	53.0	3	53.03	53	.03	1	(69)
						00.00			00.00	00.0	Ŭ I	00.00	00.0	<u> </u>	00.00	00		J	()
(70)m=		ins gains			a) 0	0	<u> </u>	0	0	0		0	0		0		) )	1	(70)
									0	0		0	0		Ů		5	J	(10)
	<u> </u>	vaporatio	<u> </u>	<u> </u>		, ,	-	,	-103.05	-103.0	<u>_</u>	-103.05	102	05	-103.05	-10	0.05	1	(71)
					-103.05	-103.05	-ı	03.05	-103.05	-103.0	5	-103.05	-103.	05	-103.05	-10,	5.05	J	(71)
		gains (1		<u> </u>	440.05				400.00			440.40			1 4 9 9 9 9			1	(70)
(72)m=	132.64		125.	2	118.95	114.7	1	08.72	103.63	110.1	-	112.46	119.2		126.89		).33	J	(72)
		I gains =	1				<u> </u>		r , ,	r , ,			, <i>,</i>	-	71)m + (72)			1	(70)
(73)m=	636.91		609.7	4	574.66	538.76	5	06.5	487.55	496.3	32	516.42	551.	73	591.02	620	).73		(73)
	lar gain	s: calculated	uning o	olor	flux from	Toble 6e	and		iotod ogua	tiona tr		nvort to th	o oppli	00	blo originator	ion			
	•	Access F	Ũ	olai	Area	I ADIE DA	anu	Flu	•				ie appli	Cal	FF	.1011.		Gains	
Onenta		Table 6d			m²				ble 6a		Та	g_ able 6b		Т	able 6c			(W)	
Southe	ast <u>0.9x</u>	0.77		v	6	4	v		06 70	I _ Г		0.62	<b>٦</b> 、	Г	0.7		_	. ,	7(77)
	ast 0.9x	0.77		x	6.		x	r	86.79	X     [		0.63	×	F	0.7		=	68.56	(77)
	ast $0.9x$	0.77		x	6.		x		62.67	X     [		0.63		Ļ	0.7		=	116.78	(77)
		0.77		x	6.		x		85.75	X     [		0.63	×	Ļ	0.7		=	159.78	(77)
	ast 0.9x	0.77		x	6.		x		06.25			0.63	×	Ļ	0.7		=	197.98	(77)
Southe	asi ().9x	0.77	1	х	6.	1	х	1	19.01	×		0.63	x	1	0.7		=	221.76	(77)

															_
Southeast 0.9x	0.77	x	6.	1	x	1	18.15	x		0.63	×	0.7	=	220.15	(77)
Southeast 0.9x	0.77	x	6.	1	x	1	13.91	x		0.63	x	0.7	=	212.25	(77)
Southeast 0.9x	0.77	x	6.	1	x	1	04.39	x		0.63	x	0.7	=	194.51	(77)
Southeast 0.9x	0.77	x	6.	1	x	g	2.85	x		0.63	x	0.7	=	173.01	(77)
Southeast 0.9x	0.77	x	6.	1	x	6	9.27	x		0.63	x	0.7	=	129.07	(77)
Southeast 0.9x	0.77	x	6.	1	x	4	4.07	x		0.63	x	0.7	=	82.12	(77)
Southeast 0.9x	0.77	x	6.	1	x	3	1.49	×		0.63	x	0.7	=	58.67	(77)
Southwest <sub>0.9x</sub>	0.77	x	6.0	)7	x	3	6.79	]		0.63	x	0.7	=	68.31	(79)
Southwest <sub>0.9x</sub>	0.77	x	6.0	)7	x	6	2.67	]		0.63	x	0.7	=	116.36	(79)
Southwest0.9x	0.77	x	6.0	)7	x	8	5.75	]		0.63	x	0.7	=	159.21	(79)
Southwest <sub>0.9x</sub>	0.77	x	6.0	)7	x	1	06.25	]		0.63	x	0.7	=	197.27	(79)
Southwest <sub>0.9x</sub>	0.77	x	6.0	)7	x	1	19.01	]		0.63	x	0.7	=	220.96	(79)
Southwest <sub>0.9x</sub>	0.77	x	6.0	)7	x	1	18.15	]		0.63	x	0.7	=	219.36	(79)
Southwest0.9x	0.77	x	6.0	)7	x	1	13.91	Ī		0.63	x	0.7	=	211.48	(79)
Southwest0.9x	0.77	x	6.0	)7	x	1	)4.39	İ		0.63		0.7	=	193.81	(79)
Southwest <sub>0.9x</sub>	0.77	x	6.0	)7	x	g	2.85	i		0.63		0.7	=	172.39	(79)
Southwest <sub>0.9x</sub>	0.77	x	6.0	)7	x	6	9.27	İ		0.63		0.7	=	128.6	(79)
Southwest <sub>0.9x</sub>	0.77	×	6.0	)7	x	4	4.07	ĺ		0.63		0.7	=	81.82	(79)
Southwest <sub>0.9x</sub>	0.77	×	6.0	)7	x	3	1.49	ĺ		0.63	 × [	0.7	=	58.46	(79)
Northwest 0.9x	0.77	×	4.	58	x	1	1.28	x		0.63	- ×	0.7	=	15.79	(81)
Northwest 0.9x	0.77	×	4.5	58	x	2	2.97	x		0.63		0.7	=	32.14	(81)
Northwest 0.9x	0.77	×	4.5	58	x	4	1.38	x		0.63	 × [	0.7	=	57.91	(81)
Northwest 0.9x	0.77	×	4.	58	x	6	7.96	x		0.63	- ×	0.7	=	95.1	(81)
Northwest 0.9x	0.77	×	4.5	58	x		1.35	x		0.63		0.7	=	127.83	(81)
Northwest 0.9x	0.77	×	4.5	58	x	9	7.38	x		0.63	- ×	0.7	=	136.28	(81)
Northwest 0.9x	0.77	x	4.	58	x		91.1	×		0.63		0.7	=	127.49	(81)
Northwest 0.9x	0.77	x	4.5	58	x	7	2.63	x		0.63		0.7	=	101.63	(81)
Northwest 0.9x	0.77	x	4.	58	x	5	0.42	×		0.63	_ x [	0.7	=	70.56	(81)
Northwest 0.9x	0.77	x	4.5	58	x	2	8.07	×		0.63	×	0.7	=	39.28	(81)
Northwest 0.9x	0.77	x	4.5	58	x	· ·	14.2	×		0.63	×	0.7	=	19.87	(81)
Northwest 0.9x	0.77	x	4.	58	x	9	9.21	×		0.63	x	0.7	=	12.89	(81)
						-		-							
Solar gains in	watts, ca	alculated	for eac	h mont	h			(83)m	n = Su	m(74)m .	(82)m				
(83)m= 152.66		376.9	490.35	570.54		75.79	551.22	489	9.96	415.96	296.95	5 183.81	130.03		(83)
Total gains –	1		r ,	<del>, ,</del>	<u> </u>	,								1	
(84)m= 789.57	897.61	986.63	1065	1109.3	3 10	082.29	1038.77	986	5.28	932.38	848.67	774.83	750.76	J	(84)
7. Mean inte	rnal temp	erature	(heating	seaso	n)										
Temperature	e during h	eating p	eriods i	n the liv	/ing	area	rom Tak	ole 9	, Th1	(°C)				21	(85)
Utilisation fa	ctor for g	ains for	living ar	ea, h1,	m (s	ee Ta	ble 9a)					-		-	
Jan	Feb	Mar	Apr	May	/	Jun	Jul	A	ug	Sep	Oct	Nov	Dec		
(86)m= 0.89	0.85	0.78	0.67	0.54		0.39	0.29	0.3	31	0.48	0.7	0.85	0.9	J	(86)
Mean interna	al tempera	ature in	living ar	<u>ea T</u> 1 (	follc	w ste	ps <u>3</u> to 7	7 in T	[able	9c)				_	
(87)m= 19.86	20.1	20.39	20.7	20.88	2	20.97	20.99	20.	.99	20.94	20.7	20.25	19.81		(87)

Temp	erature	during h	neating p	periods i	n rest of	dwelling	from Ta	ble 9, T	h2 (°C)					
=m(88)	20.23	20.23	20.23	20.25	20.25	20.26	20.26	20.26	20.26	20.25	20.24	20.24		(88)
Utilisa	ation fac	tor for g	ains for	rest of d	welling,	h2,m (se	e Table	9a)						
(89)m=	0.88	0.83	0.76	0.64	0.5	0.35	0.24	0.26	0.44	0.67	0.83	0.89		(89)
Mean	interna	l temper	ature in	the rest	of dwelli	ing T2 (f	ollow ste	eps 3 to 3	7 in Tabl	e 9c)				
(90)m=	18.71	19.05	19.46	19.88	20.12	20.23	20.26	20.26	20.2	19.9	19.28	18.66		(90)
									f	LA = Livin	g area ÷ (4	4) =	0.34	(91)
Mean	interna	l temper	ature (fo	or the wh	ole dwe	lling) = fl	_A × T1	+ (1 – fL	.A) × T2					
(92)m=	19.11	19.41	19.78	20.16	20.38	20.49	20.51	20.51	20.45	20.17	19.62	19.06		(92)
Apply	adjustn	nent to t	he mear	n interna	l temper	ature fro	m Table	4e, whe	ere appro	opriate				
(93)m=	19.11	19.41	19.78	20.16	20.38	20.49	20.51	20.51	20.45	20.17	19.62	19.06		(93)
			uirement											
			ternal ter or gains	•		ned at ste	ep 11 of	Table 9	b, so tha	t Ti,m=(	76)m an	d re-calc	ulate	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa			ains, hm	· ·	Indy	Udit	Uui	, tug	000	000	1101			
(94)m=	0.86	0.82	0.75	0.64	0.51	0.36	0.26	0.28	0.45	0.67	0.81	0.87		(94)
Usefu	ıl gains,	hmGm	, W = (94	4)m x (8	4)m									
(95)m=	680.96	732.64	738.31	682.99	564.87	393.53	265.45	277.23	418.38	567.21	629.37	656.88		(95)
Mont	nly aver	age exte	ernal tem	perature	e from Ta	able 8								
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
	r		an intern	· · · ·	1		- ,		r í í	-	r		I	()
(97)m=		1036.58	945.47	787.58	605.01	402.97	267.59	280.2	437.94	667.26	878.54	1050.1		(97)
•		· ·	ement fo	1	i	1		1	Í	<u> </u>	<u> </u>	000 50		
(98)m=	283.01	204.25	154.13	75.3	29.86	0	0	0	0	74.43	179.4	292.56	4000.04	
-		_						lota	al per year	(kwh/yeai	r) = Sum(9	8)15,912 =	1292.94	(98)
Spac	e heatin	g require	ement in	kWh/m <sup>2</sup>	²/year								14.93	(99)
9b. En	ergy rec	luiremer	nts – Cor	mmunity	heating	scheme								
-		•	bace hea	• •		-		• •	•		unity scł	neme.	0	
			from se			-	•		1) U II N	one			0	(301)
Fractic	on of spa	ace heat	from co	mmunity	/ system	1 – (30′	l) =						1	(302)
	-	-	y obtain he s, geotherr							up to four	other heat	sources; ti	he latter	
Fractic	on of hea	at from C	Commun	ity boile	rs								1	(303a)
Fractio	on of tota	al space	heat fro	m Comr	nunity bo	oilers				(3	02) x (303	a) =	1	(304a)
Factor	for cont	rol and	charging	methoc	l (Table	4c(3)) fo	r commu	unity hea	ating sys <sup>-</sup>	tem			1	(305)
Distrib	ution los	s factor	(Table 1	12c) for (	commun	ity heatii	ng syste	m					1.05	(306)
Space	heating	3											kWh/year	-
Annua	l space	heating	requirem	nent									1292.94	7
Space	heat fro	m Com	munity b	oilers					(98) x (30	04a) x (30	5) x (306) :	=	1357.59	(307a)
Efficie	ncy of se	econdar	y/supple	mentary	heating	system	in % (fro	om Table	e 4a or A	ppendix	E)		0	(308
														_

Space heating requirement from second	dary/supplementary system	(98) x (301) x <sup>-</sup>	100 ÷ (308) =		0	(309)
Water heating Annual water heating requirement				Г	2230.63	1
If DHW from community scheme: Water heat from Community boilers		(64) x (303a) x	(305) x (306) =		2342.16	_ (310a)
Electricity used for heat distribution	0		7e) + (310a)(310e	e)] =	37	] (313)
Cooling System Energy Efficiency Ratio			, , , , ,		0	](314)
Space cooling (if there is a fixed cooling		= (107) ÷ (314)	) =		0	(315)
Electricity for pumps and fans within dw mechanical ventilation - balanced, extra	elling (Table 4f):				336.77	](330a)
warm air heating system fans					0	](330b)
pump for solar water heating					0	](330g)
Total electricity for the above, kWh/year		=(330a) + (330	)b) + (330g) =		336.77	](331)
Energy for lighting (calculated in Appen			, , , ,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,		370.34	] (332)
Electricity generated by PVs (Appendix					-872.75	] (333)
Electricity generated by wind turbine (A	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	)			0	](334)
10b. Fuel costs – Community heating		,		L	-	]```
	<b>Fuel</b> kWh/year		el Price ble 12)		<b>Fuel Cost</b> £/year	
Space heating from CHP	(307a) x		4.24 × 0.0	01 =	57.56	(340a)
Water heating from CHP	(310a) x		4.24 × 0.0	01 =	99.31	(342a)
		Fue	el Price			-
Pumps and fans	(331)		13.19 x 0.0	- 10	44.42	(349)
Energy for lighting	(332)		13.19 x 0.0	01 =	48.85	(350)
Additional standing charges (Table 12)					120	(351)
Energy saving/generation technologies Total energy cost	= (340a)(342e) + (345)(354) =			Г	370.14	(355)
11b. SAP rating - Community heating	scheme					<b>J</b> , , ,
Energy cost deflator (Table 12)				Г	0.42	(356)
Energy cost factor (ECF)	[(355) x (356)] ÷ [(4) + 45.0] =				1.18	(357)
SAP rating (section12)					83.52	(358)
12b. CO2 Emissions – Community heat	ing scheme					
		Energy Wh/year	Emission fac kg CO2/kWh		missions g CO2/year	
	ĸ	wii/yeai	kg 002/kwii		g 002/year	
CO2 from other sources of space and w Efficiency of heat source 1 (%)		-	-	-	94	(367a)
	vater heating (not CHP) If there is CHP using two fu	-	-	-		(367a) (367)

Total CO2 associated with community systems	(363)(366) + (368)(37)	2)	=	869.36	(373)
CO2 associated with space heating (secondary)	(309) x	0	= [	0	(374)
CO2 associated with water from immersion heater or instan	taneous heater (312) x	0.22	= [	0	(375)
Total CO2 associated with space and water heating	(373) + (374) + (375) =		[	869.36	(376)
CO2 associated with electricity for pumps and fans within de	welling (331)) x	0.52	= [	174.78	(378)
CO2 associated with electricity for lighting	(332))) x	0.52	= [	192.2	(379)
Energy saving/generation technologies (333) to (334) as ap Item 1	plicable	0.52 × 0.01	=	-452.96	(380)
Total CO2, kg/year sum of (376)(382) =				783.39	(383)
Dwelling CO2 Emission Rate (383) ÷ (4) =				9.05	(384)
El rating (section 14)				92.02	(385)
13b. Primary Energy – Community heating scheme					
	Energy kWh/year	Primary factor		Energy /h/year	
Energy from other sources of space and water heating (not Efficiency of heat source 1 (%) If there is CHP	CHP) using two fuels repeat (363) to	(366) for the second	fuel	94	(367a)
Efficiency of heat source 1 (%) If there is CHP		(366) for the second	fuel [ = [	94 4801.8	(367a) (367)
Efficiency of heat source 1 (%) If there is CHP	using two fuels repeat (363) to	、 <i>,</i>	L		
Efficiency of heat source 1 (%) If there is CHP Energy associated with heat source 1 [(30	using two fuels repeat (363) to )7b)+(310b)] x 100 ÷ (367b) x	1.22	= [	4801.8	(367)
Efficiency of heat source 1 (%)If there is CHPEnergy associated with heat source 1[(30)Electrical energy for heat distribution[(30)	using two fuels repeat (363) to 07b)+(310b)] x 100 ÷ (367b) x [(313) x (363)(366) + (368)(37)	1.22 2)	= [	4801.8 113.58	(367) (372)
Efficiency of heat source 1 (%) If there is CHP Energy associated with heat source 1 [(30 Electrical energy for heat distribution Total Energy associated with community systems	using two fuels repeat (363) to 07b)+(310b)] x 100 ÷ (367b) x [(313) x (363)(366) + (368)(37)	1.22 2)	= [	4801.8 113.58 4915.38	(367) (372) (373)
Efficiency of heat source 1 (%)If there is CHPEnergy associated with heat source 1[(30)Electrical energy for heat distributionTotal Energy associated with community systemsif it is negative set (373) to zero (unless specified otherwise)	using two fuels repeat (363) to 07b)+(310b)] x 100 ÷ (367b) x [(313) x (363)(366) + (368)(373) (369) x	1.22 ()	= [ = [ = [	4801.8 113.58 4915.38 4915.38	(367) (372) (373) (373)
Efficiency of heat source 1 (%)If there is CHPEnergy associated with heat source 1[(30)Electrical energy for heat distribution[(30)Total Energy associated with community systems <i>if it is negative set (373) to zero (unless specified otherwis</i> Energy associated with space heating (secondary)	using two fuels repeat (363) to 07b)+(310b)] x 100 ÷ (367b) x [(313) x (363)(366) + (368)(373) (369) x	1.22 () () () () () () () () () ()	= [ = [ = [ = [	4801.8 113.58 4915.38 4915.38 0	(367) (372) (373) (373) (373) (374)
Efficiency of heat source 1 (%)If there is CHPEnergy associated with heat source 1[(30)Electrical energy for heat distribution[(30)Total Energy associated with community systems <i>if it is negative set (373) to zero (unless specified otherwite)</i> Energy associated with space heating (secondary)[(31)Energy associated with water from immersion heater or inst	using two fuels repeat (363) to 07b)+(310b)] x 100 ÷ (367b) x [(313) x (363)(366) + (368)(37) (369) x (309) x cantaneous heater(312) x	1.22 () () () () () () () () () ()	= [ = [ = [ = [	4801.8 113.58 4915.38 4915.38 0 0	(367) (372) (373) (373) (373) (374) (375)
Efficiency of heat source 1 (%)If there is CHPEnergy associated with heat source 1[(30)Electrical energy for heat distributionTotal Energy associated with community systemsif it is negative set (373) to zero (unless specified otherwide)Energy associated with space heating (secondary)Energy associated with water from immersion heater or instTotal Energy associated with space and water heating	using two fuels repeat (363) to 07b)+(310b)] x 100 ÷ (367b) x [(313) x (363)(366) + (368)(372) (369) x (309) x cantaneous heater(312) x (373) + (374) + (375) = (315) x	1.22 () (_) (	= [ = [ = [ = [	4801.8 113.58 4915.38 4915.38 0 0 0 4915.38	(367) (372) (373) (373) (373) (374) (375) (376)
Efficiency of heat source 1 (%)If there is CHPEnergy associated with heat source 1[(30)Electrical energy for heat distributionTotal Energy associated with community systems <i>if it is negative set (373) to zero (unless specified otherwid</i> Energy associated with space heating (secondary)Energy associated with water from immersion heater or instTotal Energy associated with space and water heatingEnergy associated with space cooling	using two fuels repeat (363) to $(363) + (310b) \times 100 \div (367b) \times [(313) \times (363) \dots (366) + (368) \dots (372) \times (369) \times (309) \times (309) \times (373) + (374) + (375) = (315) \times (3$	1.22 () () () () () () () () () ()	= [ = [ = [ = [ = [	4801.8 113.58 4915.38 4915.38 0 0 0 4915.38 0	(367) (372) (373) (373) (373) (374) (375) (376) (376)
Efficiency of heat source 1 (%) If there is CHP Energy associated with heat source 1 [(30 Electrical energy for heat distribution Total Energy associated with community systems <i>if it is negative set (373) to zero (unless specified otherwi</i> . Energy associated with space heating (secondary) Energy associated with water from immersion heater or inst Total Energy associated with space and water heating Energy associated with space cooling Energy associated with electricity for pumps and fans within	using two fuels repeat (363) to $(37b)+(310b)] \times 100 \div (367b) \times$ $[(313) \times$ (363)(366) + (368)(372) (363) $\times$ (309) $\times$ (309) $\times$ (309) $\times$ (373) + (374) + (375) = $(315) \times$ (331)) $\times$	1.22         1.22         0         1.22         3.07         3.07	= [ = [ = [ = [ = [	4801.8 113.58 4915.38 4915.38 0 0 4915.38 0 4915.38 0 1033.87	(367) (372) (373) (373) (373) (374) (375) (376) (376) (377) (377)

			User D	etails:						
Assessor Name:	Zahid Ashraf			Strom	a Num	ber:		STRO	001082	
Software Name:	Stroma FSAP 20	)12		Softwa	re Ver	sion:		Versic	on: 1.0.5.9	
		Pr	operty A	Address:	Plot 19					
Address :										
1. Overall dwelling dime	nsions:									
				a(m²)			ight(m)	1	Volume(m <sup>3</sup>	
Ground floor				36.6	(1a) x	2	2.5	(2a) =	216.5	(3a)
Total floor area TFA = (1a	a)+(1b)+(1c)+(1d)+(1	1e)+(1n	) 8	86.6	(4)					
Dwelling volume					(3a)+(3b)	)+(3c)+(3c	l)+(3e)+	.(3n) =	216.5	(5)
2. Ventilation rate:	-			_						
	main heating	secondary heating	y	other		total			m <sup>3</sup> per hou	r
Number of chimneys	0 +	0	+	0	] = [	0	X	40 =	0	(6a)
Number of open flues	0 +	0	-   +   -	0	] = [	0	x	20 =	0	(6b)
Number of intermittent fai	ns		J L_			3	x	10 =	30	(7a)
Number of passive vents						0	x ·	10 =	0	(7b)
Number of flueless gas fi	res					0	x.	40 =	0	(7c)
						0			0	
								Air ch	anges per ho	ur
Infiltration due to chimney	/s, flues and fans =	(6a)+(6b)+(7a	a)+(7b)+(7	7c) =		30		÷ (5) =	0.14	(8)
If a pressurisation test has be	een carried out or is inter	ded, proceed	l to (17), c	otherwise c	ontinue fr	om (9) to (	(16)			
Number of storeys in th	ne dwelling (ns)								0	(9)
Additional infiltration			0.05 6				[(9)	-1]x0.1 =	0	(10)
Structural infiltration: 0. if both types of wall are pr					•	uction			0	(11)
deducting areas of openin		coponaling to	ino groui		a (anoi					
If suspended wooden f		,	1 (seale	d), else	enter 0				0	(12)
If no draught lobby, ent									0	(13)
Percentage of windows	and doors draught	stripped		0.05 10.0	·· (1 4) · · 1	001			0	(14)
Window infiltration Infiltration rate				0.25 - [0.2 (8) + (10) ·		-	+ (15) -		0	(15)
Air permeability value,	a50 expressed in c	ubic metres						area	0	(16)
If based on air permeabili			•	•	•		invelope	arca	5 0.39	(17)
Air permeability value applies	-					is being u	sed		0.00	
Number of sides sheltere	d								1	(19)
Shelter factor				(20) = 1 - [		9)] =			0.92	(20)
Infiltration rate incorporati	-			(21) = (18)	x (20) =				0.36	(21)
Infiltration rate modified for		- I I			-			_	I	
	Mar Apr May	y Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind spe									I	
(22)m= 5.1 5	4.9 4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m = (22	2)m ÷ 4									
	1.23 1.1 1.08	0.95	0.95	0.92	1	1.08	1.12	1.18		
· · · ·	· · ·								•	

Adjust	ed infiltr	ation rat	e (allowi	ing for sh	elter an	d wind s	peed) =	(21a) x	(22a)m					
~	0.46	0.45	0.44	0.4	0.39	0.34	0.34	0.33	0.36	0.39	0.4	0.42		
		c <i>tive air</i> al ventila	-	rate for t	he appli	cable ca	se					Г	0	(23a)
				endix N, (2	3b) = (23a	a) × Fmv (e	equation (N	N5)) . othe	rwise (23b	o) = (23a)		L T	0	(23a) (23b)
				iency in %						, ( ,		L T	0	(23c)
			-	-	-					2h)m + (	23b) x [ <sup>/</sup>	L 1 – (23c)	-	(200)
(24a)m=	0			0	0	0	0	0	0				. 100]	(24a)
	balance	d mech:	I anical ve	entilation	without	heat rec	:overv (N	L /\\/) (24b	m = (2)	1 2b)m + (	L 23b)	<u> </u>		
(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24b)
	whole h	use ex	tract ver	ntilation of	or positiv	e input v	/entilatic	n from c	utside	<u>I</u>	<u> </u>	<u> </u>		
,				hen (240	•	•				.5 × (23t	<b>)</b> )			
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24c)
				ole hous m = (22t						0.5]				
(24d)m=	0.61	0.6	0.6	0.58	0.57	0.56	0.56	0.56	0.56	0.57	0.58	0.59		(24d)
Effe	ctive air	change	rate - er	nter (24a	) or (24b	o) or (24	c) or (24	d) in boy	(25)	•	-			
(25)m=	0.61	0.6	0.6	0.58	0.57	0.56	0.56	0.56	0.56	0.57	0.58	0.59		(25)
3 He	at losse	s and he	at loss i	paramete	r.					-				
ELEN		Gros	SS	Openin	gs	Net Ar		U-valu		AXU		k-value		AXk
Doors		area	(11-)	m	-	A ,r		W/m2	_	(W/	r)	kJ/m²∙ŀ	<b>N</b>	kJ/K
	ws Type	<u>\</u> 1				2	X	1 /[1/( 1.4 )+	=	2				(26)
						6.097	=			8.08	$\exists$			(27)
	ws Type					6.075	=	/[1/( 1.4 )+		8.05	$\exists$			(27)
	ws Type	93				4.579	) x1/	/[1/( 1.4 )+	0.04] =	6.07	╡,			(27)
Floor						9.39	×	0.13	=	1.2207	<u> </u>		$ \_ $	(28)
Walls -		78.7	′5	16.7	5	62	X	0.18	=	11.16	_ L		$ \_ $	(29)
Walls		14.3	87	2		12.37	<b>x</b>	0.18	=	2.23			$\_$ $\_$	(29)
Walls 7	Туре3	12.5	6	0		12.56	; x	0.18	=	2.26				(29)
Total a	area of e	lements	, m²			115.08	8							(31)
				effective wi nternal wall			ated using	formula 1	/[(1/U-valı	ue)+0.04] a	as given in	paragraph	3.2	
Fabric	heat los	s, W/K :	= S (A x	U)				(26)(30)	+ (32) =			[	41.08	(33)
Heat c	apacity	Cm = S(	(Axk)						((28).	(30) + (3	2) + (32a).	(32e) =	1921.35	5 (34)
Therm	al mass	parame	ter (TMI	<sup>-</sup> = Cm ÷	- TFA) in	n kJ/m²K			Indica	ative Value	: Medium	[	250	(35)
	-	sments wh ad of a de		tails of the ulation.	constructi	ion are not	t known pr	ecisely the	e indicative	e values of	TMP in Ta	able 1f		
Therm	al bridge	es : S (L	x Y) cal	culated u	using Ap	pendix k	<						11.39	(36)
			are not kr	10wn (36) =	= 0.05 x (3	1)			(0.0)	(0.0)		г		
	abric he			1						- (36) =	(0.5) (5)	l	52.47	(37)
ventila		1		d monthly		lun	11	A		$n = 0.33 \times ($	1	<u> </u>		
(38)m=	Jan 43.22	Feb 42.93	Mar 42.65	Apr 41.31	May 41.06	Jun 39.89	Jul 39.89	Aug 39.67	Sep 40.34	Oct 41.06	Nov 41.56	Dec 42.09		(38)
. ,				1.31	00.17	59.09	59.09	55.07				72.03		(00)
	r	95.4	r	02.70	02.52	02.20	02.20	02.4.4	r	n = (37) + (	r	0450		
(39)m=	95.7		95.12	93.78	93.53	92.36	92.36	92.14	92.81	93.53 Average =	94.03 Sum(39)	94.56	<u>93 78 -</u>	ge 2 of <del>3</del> 9)
Suomal	F SAP 201	∠ version:	. 1.0.5.9 (5	SAP 9.92) -	mup://ww	w.stroma.c	UIII				Jan (00)1		50.7Pa	iye∠on ⁄~∕

Heat lo	oss para	ameter (H	HLP), W	/m²K					(40)m	= (39)m ÷	- (4)			
(40)m=	1.11	1.1	1.1	1.08	1.08	1.07	1.07	1.06	1.07	1.08	1.09	1.09		
Numb	er of day	ys in mo	nth (Tab	le 1a)				•		Average =	Sum(40) <sub>1</sub> .	.12 /12=	1.08	(40)
- turno	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
			I	<b>!</b>		<b>!</b>		I						
4. Wa	ater hea	ting ene	rgy requ	irement:								kWh/ye	ear:	
if TF	A > 13.	upancy, 9, N = 1 9, N = 1		: [1 - exp	(-0.0003	349 x (TF	<sup>-</sup> A -13.9	)2)] + 0.0	)013 x (	TFA -13.		58		(42)
Reduce	the annua	al average	hot water		5% if the c	welling is	designed	(25 x N) to achieve		se target o		.39		(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wat	er usage i	in litres pei	r day for ea	ach month	Vd,m = fa	ctor from	Table 1c x	(43)						
(44)m=	104.92	101.11	97.29	93.48	89.66	85.85	85.85	89.66	93.48	97.29	101.11	104.92		_
Energy	content of	f hot water	used - cal	culated m	onthly $= 4$ .	190 x Vd,r	m x nm x L	OTm / 3600			m(44) <sub>112</sub> = ables 1b, 1		1144.64	(44)
(45)m=	155.6	136.09	140.43	122.43	117.48	101.37	93.94	107.79	109.08	127.12	138.77	150.69		
		·		·		·	·			Total = Su	m(45) <sub>112</sub> =	:	1500.8	(45)
lf instan	taneous w	vater heati	ng at point	t of use (no	o hot water	r storage),	enter 0 in	boxes (46	) to (61)					
(46)m=	23.34 storage	20.41	21.06	18.36	17.62	15.21	14.09	16.17	16.36	19.07	20.81	22.6		(46)
	-		) includir	na anv so	olar or W	WHRS	storage	within sa	ame ves	sel		150		(47)
-		. ,		ank in dw			-							
Otherv	vise if no	o stored			•			ombi boil	ers) ente	er '0' in (	47)			
	storage						. /							
				oss facto	or is kno	wn (kvvr	n/day):					39		(48)
		actor fro						(40) (40)	\ \			54		(49)
0.			•	e, kWh/ye cylinder∣		or is not	known:	(48) x (49)	) =		0.	75		(50)
Hot wa	ater stor	age loss	factor fi	rom Tabl								0		(51)
	•	neating s from Ta		on 4.3								]		(52)
		actor fro		2b								о С		(52) (53)
				e, kWh/ye	ear			(47) x (51)	) x (52) x (	53) =		, ,		(54)
		(54) in (5	-	,, .	Jul				, (- , (			75		(55)
Water	storage	loss cal	culated	for each	month			((56)m = (	55) × (41)	m				
(56)m=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(56)
If cylind	er contain	s dedicate	d solar sto	rage, (57)	m = (56)m	x [(50) – (	L H11)] ÷ (5	i0), else (5	7)m = (56)	m where (	H11) is fro	m Appendi	ix H	
(57)m=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(57)
Prima	v circuit	loss (ar	nual) fro	om Table	e 3							 C		(58)
Primar	y circuit	loss cal	culated	for each	month (		• •	65 × (41)						
		1	r	r	· · · · · ·	r	· · · · · · · · · · · · · · · · · · ·	ng and a	· ·	· · · · · ·	, 			( <b>-</b> -)
(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)

Combi	loss ca	lculated	for eac	h n	nonth (	61)m =	(60	)) ÷ 36	65 × (41)	)m									
(61)m=	0	0	0		0	0		0	0	0		0	0		0	(	0		(61)
Total h	eat req	uired for	water	hea	ating ca	lculated	d fo	r eacl	h month	(62)r	n =	0.85 × (	(45)m	+	(46)m +	(57)	m +	(59)m + (61)m	
(62)m=	202.2	178.18	187.03	، I	167.52	164.07	1.	46.47	140.53	154.	39	154.17	173.7	2	183.86	197	7.29		(62)
Solar DI	-IW input	calculated	using Ap	pen	ndix G or	Appendix	(H)	(negati	ve quantity	/) (ente	er '0'	if no sola	r contril	but	ion to wate	er hea	ating)	-	
(add a	dditiona	al lines if	FGHR	Sa	nd/or V	VWHRS	s ap	plies	, see Ap	pend	ix G	S)	_			-		_	
(63)m=	0	0	0		0	0		0	0	0		0	0		0	(	0		(63)
Output	from w	ater hea	ter																
(64)m=	202.2	178.18	187.03	، I	167.52	164.07	1.	46.47	140.53	154.	39	154.17	173.7	2	183.86	197	7.29		
											Outp	out from wa	ater hea	ate	r (annual)₁	12		2049.42	(64)
Heat g	ains fro	m water	heating	g, k	Wh/mo	onth 0.2	5 ′	[0.85	× (45)m	+ (6	1)m	n] + 0.8 x	< [(46)	m	+ (57)m	+ (5	59)m	]	
(65)m=	89.01	78.92	83.97		76.78	76.34	6	9.78	68.51	73.1	12	72.34	79.5	4	82.21	87	.38		(65)
inclu	ide (57)	m in calo	ulatior	n of	(65)m	only if c	ylir	nder i	s in the c	dwelli	ng	or hot w	ater is	s fi	rom com	mun	nity h	heating	
		ains (see			. ,	-					Ū						,	U U	
		ns (Table			·														
metab	Jan	Feb	Mar		Apr	May		Jun	Jul	Αι	Ja	Sep	Oc	t	Nov		ec	]	
(66)m=	128.81	128.81	128.81	-	128.81	128.81	-	28.81	128.81	128.	-	128.81	128.8		128.81		3.81		(66)
Lightin	n dains	(calcula	L ted in A	 Ann	endix l	equat	ion	190	rl9a)a	l Iso si		Table 5			I	I		1	
(67)m=	20.97	18.63	15.15	<u> </u>	11.47	8.57	1	7.24	7.82	10.1		13.64	17.3	2	20.22	21	.55	1	(67)
		lins (calc																J	. ,
(68)m=	232.68	235.1	229.01		216.06	199.71	<b>r</b>	84.34	174.07	3a), a		177.74	190.	7	207.05	222	2.42	1	(68)
															207.00		72	]	(00)
	35.88	35.88 (calcula	35.88	÷	35.88	25.88	-	1 L 15 35.88	35.88	, aiso 35.8		35.88	35.8	0	35.88	25	.88	1	(69)
(69)m=						33.00	3	00.00	33.00	35.0	00	33.66	35.6	0	35.66	- 35	.00	J	(03)
-		ns gains	r i i i i i i i i i i i i i i i i i i i	5a	-		-	0				-				<u> </u>		ı	( <b>70</b> )
(70)m=	3	3	3		3	3		3	3	3		3	3		3		3	J	(70)
		vaporatic	<u> </u>	_		, ,	-	,		1					r			1	
(71)m=	-103.05	-103.05	-103.05	5 -	103.05	-103.05	-1	03.05	-103.05	-103.	.05	-103.05	-103.0	)5	-103.05	-103	3.05		(71)
Water		gains (T	· · · · ·				-											1	
(72)m=	119.64	117.44	112.86	;   <sup>,</sup>	106.64	102.6	g	96.92	92.08	98.2	28	100.48	106.9	91	114.18	117	7.45	]	(72)
Total i	nterna	gains =	:					(66)	m + (67)m	ı + (68	)m +	- (69)m + (	(70)m +	• (7	'1)m + (72)	m			
(73)m=	437.94	435.8	421.67	'   :	398.81	375.53	3	53.14	338.62	344.	74	356.51	379.5	58	406.09	426	6.06		(73)
	lar gain																		
			Ũ	lar fl		Table 6a	and			tions t	0 CO	nvert to th	ie appli	cat	ole orientat	ion.			
Orienta		Access F Table 6d			Area m²			Flu	x ole 6a		т	g_ able 6b		т	FF able 6c			Gains (W)	
	-			-	111-			1 ai			-							(VV)	-
	ast <mark>0.9x</mark>	0.77		×Ĺ	6.7		x	3	6.79	x		0.63	x	Ē	0.7		=	68.56	(77)
	ast <mark>0.9x</mark>	0.77		×	6.1	l	x	6	2.67	x		0.63	×	Ĺ	0.7		=	116.78	(77)
Southe	ast <mark>0.9x</mark>	0.77		×[	6.	I	x	8	5.75	x		0.63	×		0.7		=	159.78	(77)
Southe	ast <mark>0.9x</mark>	0.77		× [	6.1		x	1	06.25	x		0.63	x		0.7		=	197.98	(77)
Southe	ast <mark>0.9x</mark>	0.77		×[	6.1		x	1	19.01	x		0.63	x		0.7		=	221.76	(77)

					_					_ ,				_
Southeast 0.9x	0.77	x	6.	1	x	118.15	x		0.63	×	0.7	=	220.15	(77)
Southeast 0.9x	0.77	X	6.	1	x	113.91	x		0.63	x	0.7	=	212.25	(77)
Southeast 0.9x	0.77	x	6.	1	x	104.39	x		0.63	x	0.7	=	194.51	(77)
Southeast 0.9x	0.77	x	6.	1	x	92.85	x		0.63	x	0.7	=	173.01	(77)
Southeast 0.9x	0.77	х	6.	1	x	69.27	x		0.63	x	0.7	=	129.07	(77)
Southeast 0.9x	0.77	x	6.	1	x	44.07	x		0.63	x	0.7	=	82.12	(77)
Southeast 0.9x	0.77	x	6.	1	x	31.49	x		0.63	x	0.7	=	58.67	(77)
Southwest <sub>0.9x</sub>	0.77	x	6.0	)7	x	36.79	]		0.63	x	0.7	=	68.31	(79)
Southwest <sub>0.9x</sub>	0.77	x	6.0	)7	x	62.67	]		0.63	x	0.7	=	116.36	(79)
Southwest0.9x	0.77	x	6.0	)7	x	85.75	]		0.63	x	0.7	=	159.21	(79)
Southwest <sub>0.9x</sub>	0.77	x	6.0	)7	x	106.25	]		0.63	x	0.7	=	197.27	(79)
Southwest <sub>0.9x</sub>	0.77	x	6.0	)7	x	119.01	]		0.63	x	0.7	=	220.96	(79)
Southwest <sub>0.9x</sub>	0.77	x	6.0	)7	x	118.15	Ī		0.63	_ x [	0.7	=	219.36	(79)
Southwest <sub>0.9x</sub>	0.77	x	6.0	)7	x	113.91	ĺ		0.63	_ x [	0.7	=	211.48	(79)
Southwest <sub>0.9x</sub>	0.77	x	6.0	)7	x	104.39	1		0.63		0.7	=	193.81	(79)
Southwest <sub>0.9x</sub>	0.77	x	6.0	)7	×	92.85	ĺ		0.63		0.7	=	172.39	(79)
Southwest <sub>0.9x</sub>	0.77	x	6.0	)7	x	69.27	i		0.63		0.7	=	128.6	(79)
Southwest <sub>0.9x</sub>	0.77	x	6.0	)7	x	44.07	i		0.63		0.7	=	81.82	(79)
Southwest <sub>0.9x</sub>	0.77	x	6.0	)7	×	31.49	1		0.63		0.7	=	58.46	(79)
Northwest 0.9x	0.77	x	4.5	58	x	11.28	x		0.63		0.7	=	15.79	(81)
Northwest 0.9x	0.77	x	4.5	58	×	22.97	x		0.63		0.7	=	32.14	(81)
Northwest 0.9x	0.77	x	4.5	58	× [	41.38	l x		0.63	 × [	0.7	=	57.91	(81)
Northwest 0.9x	0.77	x	4.5	58	×	67.96	x		0.63	- ×	0.7	=	95.1	(81)
Northwest 0.9x	0.77	x	4.5	58	× [	91.35	x		0.63		0.7	=	127.83	(81)
Northwest 0.9x	0.77	x	4.5	58	× [	97.38	x		0.63		0.7	=	136.28	(81)
Northwest 0.9x	0.77	x	4.5	58	×	91.1	x		0.63	- ×	0.7	=	127.49	(81)
Northwest 0.9x	0.77	x	4.5	58	× [	72.63	x		0.63		0.7	=	101.63	(81)
Northwest 0.9x	0.77	x	4.5	58	×	50.42	x		0.63		0.7	=	70.56	(81)
Northwest 0.9x	0.77	x	4.5	58	x	28.07	×		0.63		0.7	=	39.28	(81)
Northwest 0.9x	0.77	x	4.5	58	×	14.2	x		0.63		0.7	=	19.87	(81)
Northwest 0.9x	0.77	x	4.5	58	×	9.21	x		0.63		0.7	=	12.89	(81)
							4			·				
Solar gains in	watts, ca	lculated	for eac	h month	1		(83)m	n = Su	um(74)m .	(82)m				
(83)m= 152.66	265.28	376.9	490.35	570.54	575.7		489	9.96	415.96	296.95	183.81	130.03		(83)
Total gains –	internal a	nd sola	<sup>-</sup> (84)m =	= (73)m	+ (83)	m , watts								
(84)m= 590.6	701.08	798.56	889.16	946.07	928.9	3 889.84	834	4.7	772.47	676.52	589.9	556.09		(84)
7. Mean inte	rnal temp	erature	(heating	seasor	ı)									
Temperature	during h	eating p	eriods ir	n the livi	ng are	a from Tal	ole 9	, Th1	1 (°C)				21	(85)
Utilisation fac	ctor for ga	ains for	living are	ea, h1,m	n (see	Table 9a)	-				_			_
Jan	Feb	Mar	Apr	May	Jur	n Jul	A	ug	Sep	Oct	Nov	Dec		
(86)m= 1	0.99	0.97	0.92	0.8	0.61	0.45	0.	5	0.75	0.95	0.99	1		(86)
Mean interna	al tempera	ature in	living ar	ea T1 (f	ollow s	steps 3 to 7	7 in T	Table	e 9c)					
(87)m= 19.9	1 1		1		1		1						1	(07)
(07)11= 19.9	20.08	20.34	20.66	20.88	20.98	3 21	20.	.99	20.94	20.64	20.21	19.87		(87)

Temp	erature	during h	neating p	periods ir	n rest of	dwelling	from Ta	ble 9, T	h2 (°C)					
=m(88)	20	20	20	20.01	20.02	20.03	20.03	20.03	20.02	20.02	20.01	20.01		(88)
Utilisa	ation fac	tor for g	ains for	rest of d	welling,	h2,m (se	e Table	9a)						
(89)m=	1	0.99	0.97	0.9	0.75	0.53	0.35	0.4	0.67	0.93	0.99	1		(89)
Mean	interna	l temper	ature in	the rest	of dwelli	ing T2 (fo	ollow ste	eps 3 to 3	7 in Tabl	e 9c)				
(90)m=	18.53	18.8	19.18	19.62	19.91	20.01	20.03	20.03	19.98	19.61	19	18.5		(90)
									f	LA = Livin	g area ÷ (4	+) =	0.34	(91)
Mean	interna	l temper	ature (fc	or the wh	ole dwe	lling) = fl	LA × T1	+ (1 – fL	.A) × T2					
(92)m=	19	19.24	19.58	19.98	20.24	20.35	20.36	20.36	20.31	19.96	19.41	18.97		(92)
Apply	adjustn	nent to t	he mear	n internal	temper	ature fro	m Table	4e, whe	ere appro	opriate				
(93)m=	19	19.24	19.58	19.98	20.24	20.35	20.36	20.36	20.31	19.96	19.41	18.97		(93)
			uirement											
				mperatur using Ta		ned at ste	ep 11 of	Table 9	o, so tha	t Ti,m=(	76)m an	d re-calc	ulate	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa			ains, hm	· · ·	may			, (0.9	000			200		
(94)m=	0.99	0.98	0.96	0.9	0.76	0.56	0.39	0.43	0.7	0.93	0.99	1		(94)
Usefu	ıl gains,	hmGm	, W = (94	4)m x (84	4)m									
(95)m=	586.79	690.36	768.31	798.73	721.14	518.84	345.87	362.39	539.54	627.54	581.46	553.39		(95)
Month	nly aver	age exte	ernal tem	perature	e from Ta	able 8	1	1						
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
			1	nal tempe		i				-				()
(97)m=			1244.11		798.73	530.61	347.26	364.86	575.99	875.78	1157.89	1396.5		(97)
-			1	or each m		1	i	1			· · · · ·	007.07		
(98)m=	610.09	455.44	353.99	172.96	57.73	0	0	0	0	184.69	415.03	627.27	0077.0	
-					.,			Tota	l per year	(kvvn/year	) = Sum(98	5)15,912 =	2877.2	(98)
Space	e heatin	g require	ement in	1 kWh/m²	/year								33.22	(99)
			nts – Ind	ividual h	eating sy	ystems i	ncluding	micro-C	CHP)					
-	e heatir	-	at from a	aaandar	vlaunala	montory	avetam							
				econdar		mentary			(204)				0	(201)
				nain syst	. ,			(202) = 1 ·		(2.2.2.)]		-	1	(202)
			0	main sys				(204) = (2	02) × [1 – (	(203)] =			1	(204)
Efficie	ency of r	main spa	ace heat	ing syste	em 1								93.5	(206)
Efficie	ency of s	seconda	ry/suppl	ementar	y heating	g system	ז, %						0	(208)
	Jan	Feb	Mar	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ar
Space	e heatin	g requir	ement (c	calculate	d above)	)								
	610.09	455.44	353.99	172.96	57.73	0	0	0	0	184.69	415.03	627.27		
(211)m	n = {[(98	)m x (20	)4)]	100 ÷ (20	)6)	-	-	-						(211)
	652.51	487.1	378.6	184.98	61.75	0	0	0	0	197.53	443.88	670.88		_
								Tota	l (kWh/yea	ar) =Sum(2	211) <sub>15,1012</sub>	=	3077.22	(211)
•		•		y), kWh/	month									
	<u> </u>	, = -	00 ÷ (20	1		1								
(215)m=	0	0	0	0	0	0	0	0	0	0	0	0		٦.
								Tota	l (kWh/yea	ar) =Sum(2	215) <sub>15,1012</sub>	=	0	(215)

#### Water heating

Output from water heater (calculated abov	ve)													
	64.07 146.47	140.53	154.39	154.17	173.72	183.86	197.29							
Efficiency of water heater	79.8	(216)												
(217)m= 87.58 87.21 86.49 84.9 8	2.33 79.8	79.8	79.8	79.8	84.98	86.92	87.69		(217)					
Fuel for water heating, kWh/month														
(219)m = (64)m x 100 ÷ (217)m														
(219)m= 230.88 204.3 216.24 197.32 15	99.28 183.54	176.11	193.47	193.2 al = Sum(2	204.43	211.52	224.99							
	2435.27	(219)												
Annual totals				k	Wh/year		kWh/year							
Space heating fuel used, main system 1								3077.22						
Water heating fuel used								2435.27						
Electricity for pumps, fans and electric kee	ep-hot								_					
central heating pump:							30		(230c)					
boiler with a fan-assisted flue							45		(230e)					
Total electricity for the above, kWh/year			sum	of (230a).	(230g) =			75	(231)					
Electricity for lighting									(232)					
, , , , , , , , , , , , , , , , , , , ,								370.34						
12a. CO2 emissions – Individual heating	systems inc	luding m	icro-CHF	)										
	E	nergy			Emiss	ion fac	tor	Emissions	5					
	k'	Nh/year			kg CO	2/kWh		kg CO2/ye	ar					
Space heating (main system 1)	(2	11) x			0.2	16	=	664.68	(261)					
Space heating (secondary)	(2	15) x			0.5	19	=	0	(263)					
Water heating	(2	19) x			0.2	16	=	526.02	(264)					
Space and water heating	(2	61) + (262)	+ (263) + (	(264) =				1190.7	(265)					
Electricity for pumps, fans and electric kee	ep-hot (2	31) x			0.5	19	=	38.93	(267)					
Electricity for lighting	(2	32) x			0.5	19	=	192.2	(268)					
Total CO2, kg/year				sum c	of (265)(	271) =		1421.83	(272)					
					· · · · · · · · · · · · · · · · · · ·	,		1421.00						

TER =

16.42 (273)